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CRITICAL STUDIES OF STREET LIGHTING.

The advent of the fall season and its lengthening nights makes emphasis upon street-lighting problems timely and suggests the desirability of critical studies of lamp arrangement with the object of improving service conditions and inaugurating legitimate economies of operation. On many systems there are great opportunities for improvement in the existing installations and at nominal outlay. Companies facing the question of contract renewal will do well to survey their installations with the idea of finding out what can be done to better conditions in case the municipality demands concessions, as well as to reduce existing costs of operation and maintenance.

In the past the tendency to standardize street lighting upon a rigid design installed throughout an entire city, town or district has been too much in evidence. Insufficient attention has been paid to local street conditions and the "neighborhood" aspect of the installations has been lost from sight, once the pole location has been granted. In detail, street lighting is an intensely provincial problem which may be solved along broad engineering lines so far as the selection of lamps and the treatment of typical street lengths is concerned. There are, however, many local conditions deserving special treatment, such as variations in lamp height, style of globe or reflector, desirable disposition of luminous flux along defined paths, the proper lighting of hill crowns on highways subjected to considerable vehicular traffic, protection of adjacent buildings from glare and the economical and effective lighting of bridges. Many of these local problems can be solved by simply driving about the territory at night in an automobile, listing in a notebook the points where glare disturbs the chauffeur, compiling data as to places where energy is ineffectively applied, and noting simple changes in arrangement which are worth trying.

Not a few central-station men fail to appreciate the beneficial results of substituting a translucent globe for one of clear glass in reducing the glare from an arc lamp located at the crown of a hill, or the advantages of altering heights so that lamps on heavy grades will be above the plane of horizontal vision. The practice of hanging arc lamps over the center of a roadway instead of at the side and well above the normal line of sight of pedestrians and vehicle users deserves criticism. Too many street lamps, both arc and incandescent, are installed too

low to give the best results, this fault being particularly common on suburban bridges, to say nothing of the questionable plan of bunching too many low-voltage units together on the balustrades of such structures. Reductions in the consumption of energy may be attained in a good many cases by a careful try-out of high-powered units in place of a large number of small lamps, and in the arc-lamp field, by the adoption of improved forms of electrodes now on the market. Under circumstances where the local company feels obliged to try to better conditions as an antidote to political activity, the intimate analytical study of street lighting will often result in the presentation of a proposition which will prove beneficial to the city or town from the point of view of engineering progress and still enable the company to get a fair price for its service even if it is impossible to forestall some reduction in rates.

SIDE LIGHTS ON ELECTRIC COOKING.

Low-priced energy and electric cooking are, economically speaking, close relations. Total cost, however, including the value of food saved from shrinkage by electric oven cooking, should be figured in making estimates. Experience shows that in many cases, the saving in shrinkage, together with the decrease in cooking failures due to the close-control features of electricity and the improvement in the product resulting, will pay for the electrical installation in a short time. At present the problems of heat insulation and of disposing electric heating units effectively are being satisfactorily handled, and while we may expect further advances in operating efficiency, electric cooking has progressed well out of the purely experimental stage. Its relation to central-station rates needs more consideration, but the study of actual installations from the engineering point of view is yielding valuable information to the companies who have had the foresight to encourage this class of business.

At the recent conventon of the New England Section of the National Electric Light Association, Mr. R. S. Hale, the well known authority on rates, said that in his opinion the future of the electric cooker depends chiefly in this country on its ability to do rush work. This means a higher demand, and must be allowed for in rates which will encourage cooking service and at the same time correspond to the cost of supply. The diversity-factor of the electric stove and range, when installed generally through a community, should be investigated. The chances are it is better than might be thought; at any rate, it is well worth a thorough study.

Another school of opinion anticipates the growing popularity of the electric fireless cooker in America. It remains to be seen how the public will take to the long-hour type of service in this field, wedded as we are to speed of accomplishment even at increased cost for a poorer product. The chances are that each class of electric cooking will find its sphere of application.

KEEP WELL.

The entire world is horror-stricken by the reports of the terrible carnage which is being brought about by the present European war. Not only is the loss of life tremendous, but those who have been within the sphere of action tell us that there is no question about General Sherman's synonym for war being an appropriate one. The destruction and loss of life occurring during the war are so spectacular that they command attention, whereas loss of life which goes on in a more commonplace way fails to make an equal impression.

In this country there are killed annually by industrial accidents 35,000 men, while about 500,000 are injured. As a result a corresponding number of widows and orphans are left without protection and without means of support. While funds are being collected and subscriptions made for the assistance of those made destitute by the war in a foreign country, the suffering nearer at home goes largely unknown and unappreciated.

To be sure, workmen's compensation laws have in many states provided some, although usually an inadequate relief for those left destitute. But it must be remembered that only half the states in the Union have as yet passed such compensation laws. Even such an industrial commonwealth as Pennsylvania is still without legislation of this type and it has been enacted in very few of the Southern States. The Kern-McGillicuddy bill still hangs fire in Congress, altho favorably reported by the Judiciary Committee.

Accompanying compensation laws in many of the Northern and all of the Pacific States has come the movement for "Safety First." Not only is the sentiment for individual protection being fostered, but when an industry must itself bear the cost of the resultant accidents it is found to pay from the financial standpoint to use all measures of precaution which human ingenuity can devise.

Next to the prevention of accidents, the prevention of disease should receive consideration among not only those interested in raising the standard of our workmen and in contributing to their health and happiness, but by those in charge of factory conditions affecting this item. While sickness insurance through legislation is not likely to be an early development, a movement for conservation of health should receive general support. It is easily and frequently demonstrated that the efficient worker is the one in perfect health and that it pays any large corporation to provide every means in its power to promote the health of its employees, even at considerable outlay. Especial stress was laid upon this point by Dr. Thomas Darlington in his address before the annual convention of the Ohio Electric Light Association in July, and many large corporations are so convinced of this that they are taking active measures to conserve the health of the workers. These take the form of proper ventilation of workrooms, proper sanitary arrangements, the provision of pure drinking water through

drinking fountains, provision for bathing, and many other conveniences which have proved themselves not to be luxuries but paying investments. Among the electrical corporations the example of the American Telephone & Telegraph Company in retaining the services of Dr. Alvah H. Doty to advise the employees of this and affiliated companies as to the proper care of the body, and the publication of regular articles in the company periodicals for this purpose, is an excellent one. The slogan of "Safety First" should be supplemented by another, "Keep Well."

WIRING OLD APARTMENT HOUSES.

Elsewhere in this issue mention is made of a contract calling for the wiring of a large and old apartment house with a type of installation which is far superior to the common knob-and-tube method used for wiring old buildings when concealed work is required. The contract calls for the use of rigid-iron conduit and flexible armored conductors throughout, but, at the same time, prohibits the removal of flooring or baseboards and the damaging of any decorations.

This type of construction is without doubt far superior to knob-and-tube work, and when considered from the construction viewpoint presents very few difficulties that are not associated with inferior types of installations. It is practically as easy to fish flexible armored conductors as it is to fish individual wires, and for some classes of straight runs the installation of rigid conduit is equally as easy.

Considering the fact that the electrical contractor plans to completely wire a six-room apartment and install fixtures in three and one-half days, the wiring of old apartment houses should be a field in which the electrical contractor can secure much desirable business. The landlord of the apartment house under discussion intends to put in effect a 10-per-cent increase in rents as soon as the wiring is completed. Tenants at these increased rental rates will not be hard to secure, for the conveniences of electric lighting are such as to cause few to object to higher rentals. But the landlord does not only benefit by increased income, but also from the fact that the absence of the sooty products of gas flames reduces the annual cost of decorating, papering, etc. But this is not all, for the landlord in place of having an out-of-date apartment house for which it is difficult to secure and retain tenants, has a more modern building in his possession, the apartments of which are more readily rented and the tenants of which are more easily retained.

As an owner of an apartment house can secure a good electrical installation which will yield all of these results without causing much inconvenience to the tenants residing in the apartment house during the period of the installation, and as such work can be done in an approved manner without damage to property, the electrical contractor has before him a great field for business that should be comparatively easy to obtain. At a later date a complete description of the work involved in the apartment house under discussion and the construction methods employed will be given in our pages.

DATA ON ELECTRICAL INSPECTION.

In this issue will be found an article giving considerable data regarding the work of municipal departments of electrical inspection in various cities of the United States. These data lack completeness, owing to the failure of the officials in many cities to respond to the request for information, and they are further incomplete owing to a lack of records on the part of some departments reporting, as to the actual number of inspections made, the expenses of carrying on the work, etc. In many cases the work of electrical inspection is not separated from that of other work connected with the electrical department of the municipality, such as the care of fire-alarm, electric-lighting plants, etc., and the expenses of the different departments cannot be segregated. The information regarding fees for permits and inspections is, however, usually definite and the figures given will afford a good idea of the general condition of electrical inspection.

In the two classes of cities considered, namely, those exceeding 100,000 in population and those having a population below this figure, there seems to be a wide divergence in policy in different cities regarding the collection of fees, but it is noted with satisfaction that there are only a few cities in the country which are collecting a greater toll from the industry than is necessary for covering the expense of the services rendered. This applies generally to municipal inspection departments, but of course where inspection is left in the hands of private agencies it is to be expected that fees will be charged more than sufficient to pay the necessary expenses. It may, consequently, be noted with some surprise that there are communities where the underwriting interests or fire-prevention bureaus are providing inspection without cost to either the municipality or to the owners of buildings inspected. This is true for instance in Providence, R. I., and in Shreveport, La. In a few cities there is inspection only by the local central station before connection is permitted to its lines, but such inspection, of course, does not cover all electrical work which is installed in the city.

There seems to be a growing recognition of the public nature of the function of inspecting electrical work and a number of cities report movements on foot for the establishment of such a municipal department where none now exists.

A study of these figures by municipal inspectors and a comparison of the results obtained in their own departments with those obtained elsewhere should suggest opportunities for increased efficiency.

Big Jovian Day at Louisville.

The biggest Jovian event yet held in Louisville, Ky., was the celebration of Jovian Day on September 15. The Jovians met at Magnolia Garden, at Third Avenue and Avery Street, and invited everybody connected with the electrical business, whether members of the Jovian Order or not, to attend. There was a dance and a card party, the latter being for those who do not care for the one-step. However, there was a prize waltz of the old-fashioned variety, which brought out a lot of couples. Prizes consisting of electrical devices were given by the electrical dealers and contractors in both the dance and and card events. The members of the entertainment committee, composed of leading Jovians, were attired in Plutonian garb, with red tights, horns, tail and all the rest. Among those who adopted this devilish costume were R. E. Flower and Robert Montgomery, of the Louisville Gas & Electric Company; Harry I. Wood, of the Harry I. Wood Company; Paul Tafel, Edward Thoben, of the Federal Sign System (Electric), and Walter Clark, of the James Clark, Jr., Electric Company. The attendance was over 300.

Increase in Jovian Membership

An audit for the purpose of compiling a classified list of Jovian membership has just been completed and shows that on August 1, last, there had been 14,935 affiliations since the inception of the order in 1899, of which 13,598 were still active after deceased, resigned, expelled and suspended members were deducted.

The most remarkable feature shown by an analysis of the report is the growth of the organization during the past three years. In that period, 10,658 members, or 231 per cent, have been enrolled. Another noticeable feature is that the increase during the past year has kept pace with that of the two preceding seasons, although owing to unsettled business conditions it has been an exceptionally hard one for organizations of almost every kind.

However, the records of the Order show that a much greater amount of labor on the part of officials was necessary to maintain the rate of increase this year. The task has been an extremely arduous one and both Jupiter, W. N. Matthews, and Mercury, Ell C. Bennett, are to be congratulated on the showing made.

Philadelphia Jovians Active.

The evening of September 15 was observed by the Jovians of Philadelphia, Pa., as Jovian Day. A fine rejuvenation was held in the Green Room of the Hotel Adelphia; this marked the beginning of the season's activities. The first of the regular luncheons of the Philadelphia Jovian League will be held in the same place at 12:30 noon of September 24. The Philadelphia Jovians will take an active part in the Mardi Gras celebration and get-together meeting on September 19 of electrical sales representatives, all co-operating with the Commercial Section of the National Electric Light Association.

Electrical Supplies Needed in Argentina.

The Chicago Association of Commerce maintains in Buenos Ayres, Argentina, a permanent representative and an exhibit of manufactured articles exported by its members. This representative has sent a cablegram to the Association requesting samples with lowest prices and complete details concerning a large list of goods, which includes electrical supplies. There is immediate demand for the articles named, as the local stock is almost entirely depleted.

Empire State Annual Meeting.

The annual meeting of the Empire State Gas and Electric Association will be held at 29 West Thirty-ninth Street, New York City, on Friday, October 2, at 10 a. m. Two papers will be presented at this meeting, dealing with the free supply and renewal of incandescent lamps, and with the use of gas for industrial purposes.

Luncheon will be served at the Engineers' Club, and it is expected to have addresses at that time from Edward E. McCall, chairman of the Public Service Commission, First District and Seymour Van Santvoord, chairman of the Public Service Commission, Second District. The secretary is C. H. B. Chapin, with office at the above address.

Jobbers' Meeting at Niagara Falls.

The quarterly meeting of the Electrical Supply Jobbers' Association of the United States was held at the Clifton Hotel, Niagara Falls, Can., on September 9, 10 and 11. The presence of several officers of the Department of Justice lent an unusual air to the occasion. Brief addresses were made by Franklin Overbagh, general secretary of the Association, and T. M. Debevoise, and at the open session on Friday a general discussion was had by manufacturers and jobbers with regard to the relation and amelioration of their interests.

Chicago Electrical Show Postponed.

Announcement has been made that it has been deemed advisable to postpone this year's Chicago Electrical Show, which was scheduled to be held from October 31 to November 14, 1914. The dates for the holding of the future show have not yet been determined upon.

Stationary Engineers Hold Annual Convention at Milwaukee.

The National Association of Stationary Engineers held its annual convention at Milwaukee, Wis., in the amphitheater of the Milwaukee Auditorium from September 7 to September 11, inclusive. There was a comprehensive exhibit of steam and electrical appliances and accessories. About 1,500 representative engineers from all parts of the country attended the convention. Some of the larger manufacturing plants in Milwaukee were inspected, including the gathering of about a thousand of the delegates at the West Allis plant of the Allis-Chalmers Manufacturing Company, where luncheon was served in the company's clubhouse. In addition to the formal meetings the scheduled events included a field day, smoker and a reception and installation of officers. The next convention will be held at San Francisco. The officers were elected for the year as follows:

President, Frederick L. Ray, Louisville, Ky.; vice-president, Walter H. Damon, Springfield, Mass.; secretary, Fred W. Raven, Chicago.

Institute of Radio Engineers.

The first meeting of the Institute of Radio Engineers for this season was held on September 2 at Columbia University, New York City. David Sarnoff, of the Marconi Wireless Telegraph Company, presented a paper on "Radio Traffic." The passage of a wireless telegraph message from sender to destination over interlinked line and radio telegraphs was traced and the difficulties in traffic handling imposed by the present radio laws were discussed. A brief description of the traffic methods to be used in operating the Belmar-New Brunswick transatlantic stations followed.

V. Ford Greaves, George S. Davis, Robert H. Marriott, Emil J. Simon and John L. Hogan, Jr., discussed the paper at some length, taking up more particularly the need of radio legislation designed to meet modern conditions of radio engineering. The next meeting will be held October 7.

Philadelphia Institute Meeting.

The Board of Directors of the American Institute of Electrical Engineers has authorized an Institute meeting to be held in Philadelphia on Monday, October 12, under the auspices of the Philadelphia Section and the Committee on Use of Electricity in Marine Work.

The following papers will be presented: "The Electrical Equipment of the Argentine Battleship *Moreno*," by H. A. Hornor; "Submarine Signaling," by R. A. Fessenden; "Electrical Features of the United States Reclamation Service," by F. H. Newell.

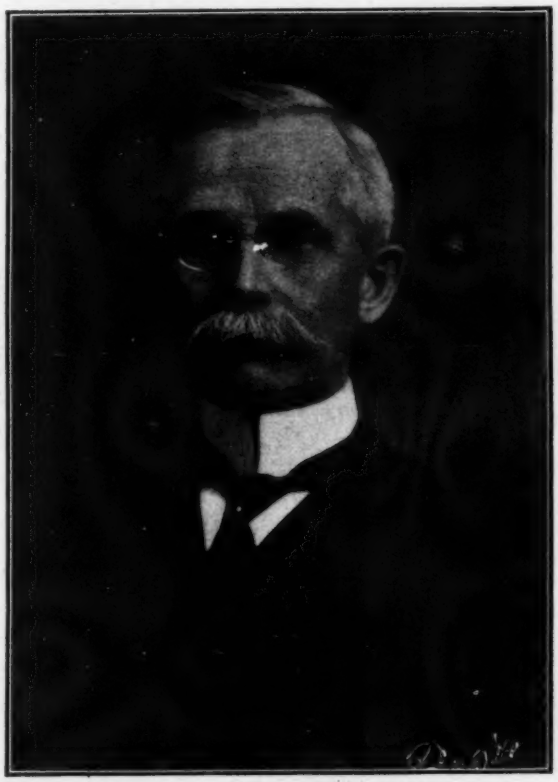
Henry Abbott.

The saving of time is a most commendable proposition. In order that time may be economized it is essential that there be available a method of measuring the elapsed time taken to perform any piece of work or function. Particularly in the electrical industry, where so many other factors count heavily, accurate knowledge of elapsed time is of importance. Consequently the result of the genius of Henry Abbott is of more than passing interest to the electrical industry. Henry Abbott is the inventor of the calculagraph, and the events leading up to the development of this instrument are as full of romance as one could wish.

Henry Abbott was born in the early 60's in the town of Danbury, Conn. He went to the little red schoolhouse in the Kings Street District, and when about 12 years of age he moved with his family to Rahway, N. J., where he attended the public school. At the age of 16 he left school and was apprenticed to learn the watch-making trade with Gaven Spence at Newark, N. J. He remained here about five years, his lessons in watch-making consisting in the main of tending the furnace, sweeping and dusting the store, washing windows and show cases, and running errands. Work at that time began at six in the morning and the store stayed open until nine at night. On Saturdays and during the week before Christmas the store closed at 11:00 o'clock. Henry was not much of a success at furnace tending and so the boss had to do that part of the work for himself. Young Abbott was an apt boy, however, and it was not long before he was being instructed in the repairing of jewelry, spectacles and clocks. During the last half of his five years of service he had so developed that he was the head watch-maker in the establishment. There were four others old enough to be his father, and he hired and discharged the help, bought the goods, kept the books and paid the bills. During this time his average salary was $4 a month, and as head watch-maker he received the munificent stipend of $8 per month.

Having completed his term of service he resigned and went to New York City and got a job with Sam B. Parker at No. 7 Maiden Lane, at $25 a week. Parker was repairing watches for the trade. Shortly thereafter Parker became very ill and unable to attend to business. The establishment was sold out to Mr. Abbott, who borrowed money to pay for the tools and fixtures. The watch-making business was continued and specialized. Complicated and expensive watches and jobs too difficult for the average watch-tinker to handle were undertaken. Fifteen hours a day of steady work, however, was fraught with disastrous results; a permanent injury to his eyesight was the price paid for this industry and over-ambition.

In 1876, 1877 and 1878 Mr. Abbott took out patents on improvements in watches, one each year. The latter, an open-face stem-winding watch, was adopted by the Rockford Watch Company. The parts covered by patents were first manufactured by Mr. Abbott for the company. Later the complete watch was made at the company's factory.



Henry Abbott,
Inventor of the Calculagraph.

In 1879 he began the manufacture of stem-winding attachments for watches for converting key-wound watches into stem-winders. Over 100,000 watches were converted by these devices and the several different styles were covered by a dozen or more patents. In 1881 and 1882 Mr. Abbott was engaged in the business of manufacturing enameled dials for watches. At that time the only dial painters available were imported from France and Switzerland. Paid at first at a rate of $3 per day, although their earnings in the mountains of Switzerland would not average more than 18 cents per day, these expert workmen soon ran the price up until $6 and $7 per day were demanded. The business was discontinued pending experiments with a view to painting the watch dials by machinery. About two years' time and several thousands of dollars were expended on experiments, which were finally successful. The machinery, process and product were covered by a series of 10 patents, which were sold to the Elgin National Watch Company in 1884. By the use of these improvements nine girls were able to do the work formerly done by 120 men. The cost of putting the figures, circles, division marks and names on watch dials was thus reduced from an average of $1.50 to about four cents each.

In 1886 he made models of three different complete watches of unique design and construction, and although they were patented, they never were put on the market. In 1890 Mr. Abbott designed special tools for the manufacture of a typewriting machine sufficient to equip an entire plant. This work was done for the Automatic Typewriter Company. Patents were taken out covering several of these tools. One worthy of particular mention was a machine for cold-swaging steel type and type-bar in a single piece and correctly positioning the characters thereon, each character standing at a different angle on its bar.

In 1892 he sold four patents covering improvements in stem-winding watches to the president of the Elgin and the treasurer of the Waltham Watch Companies, for the joint use of these two companies. The patents have expired but the devices they covered are found in the watches both companies manufacture at the present time.

During the panic of 1893, Abbott lost about $30,000 in the watch and jewelry business then conducted by him at 26 Cortlandt Street, and the business passed into the hands of a receiver. A settlement was, however, promptly made with the creditors who were allowed to take everything in sight except a few personal debts. Five hundred dollars was then bor-

rowed from a disinterested friend and a new business started at 2 Maiden Lane within 30 days of the date of assignment.

Two patents were secured by him in 1897 covering improvements in spectacles and eye-glasses. One of these patents was sold to a western manufacturer and under the other several thousand pairs of glasses were made and sold in New York.

A series of experiments which he conducted, extending over a period of about six years, resulted in 1894, in the perfection of the calculagraph. The manufacture of this machine was then commenced by the Calculagraph Company, a corporation which Mr. Abbott organized and of which he is president and the largest stockholder. The chief function of this machine is to compute and record elapsed time. Twelve different models adapted to the requirements of different industries are now made. Eleven patents issued to him cover the original machine and subsequent improvements.

One type of calculagraph designed for use in telephone exchanges, has now become the standard apparatus for timing telephone toll messages in every country in the world where telephones are used. The record this machine makes shows the minutes and fractions of minutes consumed in a telephone conversation.

Many millions of dollars have been saved to the telephone companies by the use of the calculagraph, and indirectly the public has benefited, since reductions, which have from time to time been made in the charges for telephone toll service, were possible only by having accurate mechanical records of elapsed time.

Mr. Abbott as a boy had all the advantages of a country up-bringing. He learned how to play and this he considers now is just as important as learning how to study. He acquired a taste for squirrel shooting and a love of forest life, and the latter has increased with advancing years so that he is now spending about three months of every year playing in the woods, camping, fishing and hunting. Out of his experience Mr. Abbott is some philosopher. He expresses his sympathy for the inventor who is deluded with an idea that once his patent is granted his fortune is assured. He asserts that when a patent is issued his troubles have only just begun. More gray matter is required in the economic manufacture than in developing the invention and infinitely more ability, patience, perseverance, persistent effort and money must be expended in creating a demand for and coaxing the public to buy the new product than are required in the invention or the manufacture of it.

Convention of Illuminating Engineers.

As previously announced, the eighth annual convention of the Illuminating Engineering Society will be held at the Hotel Hollenden, Cleveland, O., September 21 to 24.

H. N. Sibbald, master of transportation, has announced special rates for parties of ten or more from the principal cities of the East and Central West. Such a party will occupy a special car leaving Chicago on the Lake Shore & Michigan Southern Railroad at 11:30 p. m., on Sunday, September 20.

The first session will be held at 10:30 a. m., Monday, September 21. At this session the presidential address will be made by C. O. Bond, and there will be reports from the Committee on Progress and the Committee on Research. At the afternoon session papers will be presented by L. A. Jones on "Color of Illuminants;" by M. Luckiesh and F. E. Cady on "Artificial Daylight, Its Production and Use;" and by E. J. Brady on "Development of Daylight Glass."

On Tuesday there will be morning and evening sessions. At the morning session papers will be presented by A. S. Osborne on "Relation of Light to the Inspection of Documents;" by L. B. Marks and J. E. Woodwell on "Planning for Daylight and Sunlight in Buildings;" and by C. H. Sharp on "Illumination of Light Shafts." At the evening session papers will be presented by John Hammond Smith on "Photo-Sculpturing and the Use of Light in the Reproduction and Illumination of Sculpture;" and by M. C. Rypinsky on "Color Photography."

On Wednesday parallel sessions will be held both morning and afternoon. At the morning commercial session papers will be presented by J. L. Minick on "The Locomotive Headlight;" by A. L. Powell and R. E. Harrington on "Present Practice in the Use of Tungsten-Filament Lamps for the Lighting of Metal-Working Plants;" by O. R. Hogue and A. O. Dicker on "Factory Lighting: Cost, Maintenance and Installation Data." At the afternoon commercial session there will be papers by R. F. Pierce on "Recent Improvements in Incandescent Gas Lighting;" by G. M. J. Mackay on "Characteristics of Gas-Filled Lamps;" and by E. J. Edwards on "The Lighting of Rooms Through Translucent Glass Ceilings." At the morning laboratory session there will be papers on "Light Filters for Use in Photometry," by C. E. K. Mees; "Experiments with Colored Absorbing Solutions for Use in Heterochromatic Photometry," by H. E. Ives and E. F. Kingsbury; "Characteristic Equations of Tungsten-Filament Lamps and Their Application in Heterochromatic Photometry," by G. W. Middlekauff and J. F. Skogland; "A Transmission and Absorption Photometer for Small Areas," by P. G. Nutting and L. A. Jones. At the afternoon laboratory session there will be papers by H. H. Clark on "Electrical Lamps for Mines;" by N. K. Chaney and E. L. Clark on "Notes on Ulbricht Sphere and Arc-Lamp Photometry;" by L. A. Jones on "A New Standard Light Source;" by P. G. Nutting, L. A. Jones and F. A Elliott on "Some Tests of Possible Reflecting-Power Standards."

At the session on Thursday morning there will be papers on "Some Uses of Light in the Treatment of Disease," by E. C. Titus; "Some Experiments with the Ferree Test for Eye Fatigue," by J. R. Cravath; "Further Experiments on the Efficiency of the Eye Under Different Conditions of Lighting," by C. E. Ferree and G. Rand.

In the afternoon a trip will be made to Nela Park, where the buildings of the National Lamp Works will be thrown open for inspection. Supper will be served and there will be an entertainment in the evening for both ladies and gentlemen. Two papers will also be presented at this time: "The Visibility of Radiation," by P. G. Nutting, and "Some Recent Experiments on Vision in Animals," by H. M. Johnson.

C. L. McKinstry, chairman of the Entertainment Committee, has also announced an afternoon tea for the ladies on Monday and a reception and ball for both ladies and gentlemen in the evening. On Tuesday afternoon the ladies will be taken on a sight-seeing trip, and on Wednesday afternoon they will have luncheon and cards at one of the country clubs. On Wednesday evening there will be a banquet at the Hollenden Hotel.

The Electric Club of Kansas City.

The Electric Club of Kansas City, Mo., is planning to gather at the Baltimore Hotel on alternate Tuesday noons this fall and winter the chief men in the electrical business in the vicinity of Kansas City, and to make the meetings of technical interest and value. The first meeting will be on September 29. It is hoped that any visitor who has something new to present in the way of electrical development or improvements in manufactured appliances will feel free to get up and talk; but the invitation to make a speech has not the purpose of giving a salesman time for sales talks. It is especially desired that manufacturers attend; and they are invited to notify the secretary of days when they can be present, so that announcements may be sent to the members. The secretary is W. J. Laufenburg, Western Electric Company, 611 Wyandotte Street, Kansas City, Mo.

Restaurant Lighting.

By A. L. Powell.

In many respects restaurant lighting is analogous to store lighting; in fact a restaurant is a type of retail store. Both must cater to the public, and all features of their layouts must appeal to the prospective buyer and exert some drawing power to compel the chance passer-by to enter and purchase.

Experience has shown those who have investigated the subject that correct lighting is a vital force for securing the desired end. It is, therefore, the duty of those who have this information, to disseminate it and bring it to the attention of the various proprietors who may have never seriously considered the subject.

There are three classes of stores, and a slight analysis will show us that we can divide restaurants into three similar groupings.

First we have the ordinary small store, such as is found by the hundreds in the larger cities, and every town has several. Efficiency and economy must be given first attention in designing the lighting of this class, for the total sales per day are relatively small and the operating expense must be kept low.

Next there is the department store. Here everything is done on a large scale, more money can be spent for lighting, and the artistic effect of the lighting can be given more consideration; but with the large area to be illuminated, schemes which demand a relatively large investment are often out of the question.

The last group is the high-class shop. This is usually small in size and some distinctive and novel arrangement is imperative. The artistic effect is all-important, and as rents, store up-keep, and the like, are relatively high, the efficiency of light utilization is an almost negligible factor.

Fig. 1.—Main Dining Room, Hotel McAlpin, New York City.

The first group of restaurants is the small unpretentious type and the lunch room, catering to a trade which is not inclined to be critical. No special attempt is made to carry out a harmonious scheme of decoration or novelty of arrangement. Quick service is an essential. Although the sales are very large in many cases, the prices are low, and efficiency is a most important factor. There is no demand for a lighting arrangement which is distinctive, nor is it necessary to have the room so attractively arranged as to cause one to linger for long periods.

The next step is the large restaurant, which is found in many of the department stores, the dining rooms of the less pretentious hotels, the banquet rooms attached to a hall, and the larger eating places often found in the business districts. Here efficiency becomes of less importance, and the decorative element demands consideration. One tarries longer in these rooms and becomes somewhat relaxed; the harmony of the surroundings is necessary to produce the desired results.

Finally, we reach what might be called the distinctive restaurant. Here artistic effect is everything. The dining rooms of the high-class hotels, the little exclusive restaurants and rathskellers, found in the theater districts and the like, demand "atmosphere." The lighting must be in conformity with the particular type of decoration; there must be a harmonious blending of all the elements, for these places must be cozy, and it is desirable to have the utmost comfort, for the diners remain for long periods and the place "grows" on them. This class of interior offers unlimited opportunity for the designer, and the more original the effect, the better suited.

General Requirements.

Having briefly outlined the types of

service that will be encountered, it is desirable to enumerate the features which must be given attention when discussing the lighting.

In any good lighting scheme there are a number of points which must be considered. Prominent among these is the avoidance of glare. Glare has been aptly defined as light out of place. It results when there are unshielded light sources of high intrinsic brightness in the field of vision; when one is forced to gaze at a relatively large area uniformly illuminated to quite a high intensity; when there are bright reflections from surfaces at which one is looking; and from other causes too numerous to mention.

Glare can generally be avoided by equipping the lamps with suitable diffusing or shielding reflectors, locating the lamps well out of the field of vision, and finally arranging them so that their images will not be visible in polished surfaces. These precautions should always be taken, for glare is productive of much discomfort —an undesirable element in restaurant lighting; and looking at it in a broader sense, it is the cause of much eye strain and resultant fatigue.

The next factor we might consider is diffusion. This is very closely related to glare. It is characteristic of the illumination produced from large light sources, and avoids sharp shadows. Diffusion can be secured by increasing the apparent size of the light source. To secure this effect there is usually a small loss of light, but the comfort and the gain in ability to see, more than offset this loss.

The intensity of light is of some importance, particularly in the first two groups where general illumination serves the purpose. Sufficient light must be provided in all parts of the room to enable one to see objects clearly, and to read for a short period if he desires.

In the distinctive restaurant the intensity of illumination is such a variable that it is impossible to give any general rule. Often an extremely low general illumination just sufficient to see one's way about the room, with local lighting at each table, meets the requirements; at other times a higher general illumination, supplemented by table lamps, is desirable. In each case the effect sought must be carefully analyzed.

A fairly even distribution of light is necessary where general illumination is used, but in many cases in the distinctive restaurants there are marked points of high and low lighting.

In color the light should tend toward the warmer tints rather than the blue end of the spectrum, for the complexions appear better under rosy hues, and these colors also have the psychological effect of making one more relaxed and cheerful.

Small Unpretentious Restaurants.

Some time ago the writer investigated a large number of small stores in the attempt to determine some average data in regard to their lighting. In these were included about 30 restaurants, located on the less prominent avenues and side streets of New York City and Newark, N. J. The ceilings were usually light in color, but the walls were frequently covered with a rather dark paper; occasionally, however, lined with mirrors. The dark walls made necessary a wattage rather higher than normally used for the desired illumination.

These rooms should be laid out in the regular manner for even distribution of light on the table level. As a rule, the restaurants are moderately wide and at least two rows of lamps are necessary. Bowl-shaped, prismatic reflectors with bowl-frosted Mazda lamps are probably the most efficient and suitable lighting units; next in order comes the white, or opalescent glass, bowl-shaped reflector and Mazda lamp, which, while not quite as efficient, has a somewhat more decorative value and gives better diffusion; and finally the decorative types of inclosing units. Simple pipe or chain suspensions suffice for fixtures, and if no attempt is made at garishness, the lighting can be really pleasing from its simplicity.

The minimum watts per square foot of

Fig. 2.—Department-Store Restaurant, New York City.

Fig. 3.—Department-Store Restaurant, Newark, N. J.

floor area of the restaurants investigated was 0.42; the maximum 3.20; and the average of 27 was 1.08. This value will produce a well lighted room for average conditions; and the restaurant should be well lighted, for as surely as the moth is drawn to the candle, the hungry passer-by is drawn to the brightly lighted eating place.

Fig. 4.—Daylight View of Hotel Dining Room.

Fig. 5.—Hotel Dining Room with Numerous Lighting Units.

The daily lunches undoubtedly owe much of their popularity to their bright interior finish which reflects the light back and forth and gives a very brilliant appearance. They are often lighted by a single row of lamps down the center, and as there are rows of chairs along the walls, reflectors must be chosen which give a wide distribution of light.

A test on a typical one of these rooms, lighted by 100-watt bowl-frosted Mazda lamps and extensive-type Holophane reflectors, using 0.65 watt per square foot, gave an average illumination of 2.67 foot-candles, or 4.1 effective lumens per watt When we consider that two of these lamps were located in the windows, which allowed a portion of their light to escape into the street, this value shows quite convincingly the effect of light surroundings on the resultant illumination.

Large Restaurants.

As there is much more leeway in the choice of equipment for this class, it is hardly practical to discuss the general subject. However, a few typical examples of interiors may be shown and briefly analyzed.

First, we have the department-store restaurant. Fig. 2 is a night photograph of an installation in one of New York's large stores. As the ceiling is light in color and free from obstructions, an indirect lighting system is applicable. Five 40-watt clear Mazda lamps are used above an enameled-steel, shallow bowl-shaped reflector. Glare is avoided, the light is evenly distributed, sharp shadows are eliminated and the room is restful. A close inspection will reveal clusters of lamps at the bottoms of the fans and about the capitals of the pillars. These are not used, and wisely so, for they are certainly unattractive and discomforting. The average intensity is between 1.5 and 2.1 foot-candles.

Fig. 3 is a night photograph of the restaurant in one of Newark's large department stores, utilizing semi-indirect illumination. A relatively flat opalescent glass dish of simple design, is suspended by three chains and carries a cluster of clear Mazda lamps. The installation is pleasing and well adapted to the service.

Fig. 4 is a day photograph of the dining room in a New York hotel. General illumination alone is supplied. Mazda lamps are used in rather elaborate ceiling fixtures made of a cut-glass bowl and a ring of prisms. Crystal prisms surround smaller lamps on wall brackets. While this scheme is not particularly efficient, and might be criticised from the standpoint of lack of eye protection, it is in keeping with the entire scheme of decoration in which the room is finished, and hence, the architectural continuity is secured.

Another scheme quite different from the former is employed in the dining room shown in Fig. 5. The ceiling is divided into a number of bays, by cross beams. Along these and at the sides are placed, at regular intervals, conventional lion's heads. In the mouth of each of these a low-candlepower Mazda lamp is burning. There are a multiplicity of light sources which produce a well diffused illumination, but if one is forced to gaze upward, the glare is somewhat noticeable. One feature which is always likely to be an objection to outline lighting of interiors, is the necessity of a very careful maintenance, for burned-out lamps cause dark spots and spoil the effect sought.

The next subdivision of the group we are discussing, is the large restaurant in the business section of the city. Fig. 6 is a day view of an Albany (N. Y.) dining room of this type. Mazda lamps with satin-finish prismatic reflectors are used on decorative multi-arm fixtures in a row down the center. At regular intervals along the wall, round bulb-frosted Mazda lamps with small prismatic shades are

used on brackets. The lighting equipment is efficient and neat in appearance.

Distinctive Restaurant Lighting.

With the large variety of lighting equipment from which to make a choice, it is possible to get an almost infinite number of effects. It is quite beyond the bounds of this article to discuss the ultimate possibilities; and the "case" method of dealing with the subject, is the only one practical; that is, we can show a number of characteristic illustrations and enlarge on these rather than deal in generalities.

Fig. 6.—Restaurant in Business Section of Albany.

Fig. 7.—Restaurant with Indirect Lighting.

Fig. 8.—Tea Room of Mary Elizabeth, New York City.

Fig. 9.—Rathskeller in Buffalo, N. Y.

Fig. 7 is a case where the restaurant proprietor desired a soft, well-diffused, low general illumination, supplemented by a slight amount of local lighting[1]. This is a restaurant in upper Broadway, New York City. Totally indirect, single-unit, mirrored reflectors and lighting fixtures of composition, molded into an Egyptian design, are used. 100 and 250-watt clear Mazda lamps are used in these fixtures, depending on the area to be lighted. Mirrors are set in the wall panels and above each is a two-arm verde-finished bracket with 10-watt multiple lamps and silk shades. The woodwork is cream with gold decoration, ceiling white, wall panels old-rose satin finish, chairs of mahogany, and the carpet in neutral green. The average watts per square foot is 1.1.

A tea room is one type of restaurant, and coziness is the keynote of success in these establishments. One of New York's Fifth Avenue tea rooms, which has become very popular, is that of Mary Elizabeth. Fig. 8 is a night view of the interior of this. The building is finished in white on the outside, with a fac-simile signature in black, as a sign. The interior is patterned from some New England tavern of by-gone days; the ceiling is low and finished with white plaster; the floor of wide boards, painted deep yellow and covered here and there with rag-carpet runners. On the right is an old-fashioned fire-place, and on the left a number of eating "stalls." Small tables, covered with white linen, and gilt chairs, make a most pleasing picture. Shelves, counters and windows are trimmed with a white lacy material. Mazda lamps furnish the illumination. These are surrounded by shirred silk shades, slightly colored. Sixteen 40-watt lamps are used on ceiling outlets and eight on wall brackets. The general atmosphere of the room is most inviting, and the decorations well executed.

The rathskeller is a place usually pleasingly illuminated. Fig. 9 is a night view of a popular one in the city of Buffalo, N. Y. The general tone of decoration is a deep golden brown, and peculiarly wrought chandeliers are finished to harmonize with the room decorations. Clear lamps are used, and each is surrounded by a cylinder of yellowish diffusing glass, which bears out the tone of the entire decorations. General illumination alone is used, the light is well distributed and of a fairly high intensity.

The dining rooms of the high-class hotels are, as a rule, splendidly equipped. The McAlpin, in New York City, although not the most recent innovation along hotel lines, is thoroughly up-to-date and unique in many features. No expense was spared to have everything of the highest order. Fig. 1 is a view of the main dining room. Large crystal chandeliers with all-frosted, round-bulb Mazda lamps at the tops of imitation candlesticks

1 Figs. 7 and 8 are shown through the courtesy of the Photographic Bureau of the New York Edison Company.

form the main lighting units. Bronze and crystal-glass side brackets, of a design harmonizing with the chandeliers, are used about the walls. The general treatment of the room is of the Louis XVI period, in natural oak, ornament-gilded: the side walls are hung with old-gold damask; the windows are draped with a similar material with embroidered valance. The columns and pilasters of the rooms are covered with mirrors, and give the room a most unique appearance. The ceiling is decorated in cream and gold, a very low intensity of general illumination. Silk-shaded table lamps and side-wall brackets assist materially in providing sufficient light.

Enough examples have been used to show what variation may be possible in what we might term *good restaurant lighting*. It is a field where originality plays a most important part; but originality is not the only feature to be considered; the designer should bear in mind those general principles of good illumination outlined in the opening paragraphs, if he desires to have an installation which is thoroughly satisfactory from all view points.

Fig. 10.—Grill Room in Hotel McAlpin, New York City.

which acts as a good diffusing medium and lends an imposing effect of height to the room. Each table is provided with a peculiarly shaped portable lamp with shirred-silk shade matching the wall decorations and arranged in the form of a small dome, which acts as a diffusing and reflecting medium.

The grill room, undoubtedly, is the most unique portion of the McAlpin, both as to architecture and lighting effects. Fig. 10 shows that, although the room is extremely large, yet with its peculiarly arched construction, there is a suggestion of coziness and retirement, attendant with a very much smaller room. The ceiling is relatively low and vaulted, supported by a series of massive columns. The entire room is finished in brilliantly decorated terra cotta. Recessed bowls are set in the ceiling and across the mouth of these decorated diffusing glass is placed, supplying

White Way in White Plains.

A "White Way" has become very necessary to the welfare of a village, town or city. It is a well known fact that people flee from a city that is dark and flock to the city that is bright. Possibly this trait in human nature is chiefly responsible for the installation of the hundreds of White Ways throughout the country. Certain it is that the cities having them have found a very satisfactory increase in population, real-estate values, and business prosperity.

White Way installations are frequently the result of the merchants' realization of the above facts, and their efforts and co-operative enthusiasm, when once aroused, have done more than create a White Way. Their efforts have resulted in many "booster" projects and awakened civic pride and silenced pessimists to an extent thought impossible.

The latest town to fall in line with the wide-awake communities having White Ways, is White Plains, N. Y., Thursday evening, September 3, was the gala night on which the White Plains Business and Professional Men's Association saw its plans carried to completion. It has every reason to feel proud of what it has accomplished. Not only is the business section improved in appearance, but the results of the "get-together" spirit generated by the celebration, with the parades, band concerts, banquets, speeches and contests, will be far reaching.

Among the features of the occasion was a window-display contest, prizes being awarded for the most artistic display, the most original display, and the best display from a selling standpoint. A. J. Edgell, who was present as the representative of the Society for Electrical Development, was one of the judges of these displays. The Society for Electrical Development is actively engaged in creating interest in White Way movements and at the present time is arousing interest along these lines among the merchants of 60 cities and towns. That it will be successful in many cities, is assured by the interest merchants are showing.

Commercial Practice
Management, Rates, New Business

SECURING THE SMALL-RESIDENCE BUSINESS.[1]

By E. W. Osborn.

It was only a few years ago that electric light was considered a luxury, and only within the reach of the very well-to-do. As the methods of generating electricity improved along with the development of the metallic-filament lamp, electric light became cheaper, and consequently a field was opened in the middle-class homes, which has been developed to a large extent.

Several years ago when the Mazda lamp began to be generally used, a great deal of apprehension was felt by many central-station men that the gross revenue would fall on account of the decreased current consumption of the new lamps. Experience has shown, however, that increased demand for light by the individual consumer, as well as the increased number of consumers, which was brought about by the lowered lighting costs, offset to a large extent the reduction of income per candlepower.

Development of the Mazda lamp was necessary on account of improved gas lighting, the inverted burner and the Welsbach mantle. Since the small-watt Mazda lamps, such as the 10 and 15-watt, have come on the market, electric light can compete with coal oil, the "poor man's light," and in many instances give him increased candlepower.

The small house of the poor man has heretofore been overlooked by the lighting companies on account of the apparently small revenue to be obtained and the unreliable credit of the small user. But owing to the decrease in revenue caused by Mazda lamps, it was found necessary to increase the number of consumers on the lines in order to keep up the increase in gross revenue. The gas companies have long catered to the small user by installing prepayment meters and free piping and the financial success of this method has prompted the central stations to adopt similar methods.

Aside from the direct financial gain secured through the small consumer's business, it has been noticed that the medium-sized customer who represents the middle class is attracted automatically, with a reduction in soliciting expense.

This is easily understood because a non-consumer of the middle class hears from his maid that his poorer neighbor has electric light in his home, whereas he himself is using an inferior illuminant.

It is for this reason that some salesmen of electric light companies are being paid more for the small consumer's business acquired than for larger ones, though, of course, the effort and trouble may be greater.

To make this small-residence business profitable to the central station, it is necessary that the business be secured first, on the existing lines, and second, it must be taken on a flat-rate basis, so that bills for current may be collected in advance, thereby cutting out the expense of reading and billing on a meter basis. Electricity can be sold on a profitable basis at one cent a watt per month, if a good, accurate demand limiter is used.

Electric lighting on a flat rate particularly appeals to the small-residence user, as his income is usually limited and he is quick to take advantage of having it in his small home on a known basis and at a price which cannot exceed his oil bills.

In this state we have a large percentage of foreign population, especially in the coal-mining districts. These people come to Pennsylvania directly from across the water, on account of being close to New York, their first landing place. In their native countries they are rarely accustomed to the use of electric light, and it takes considerable persuasion on the part of the salesman to get them to try an illuminant to which they are not accustomed. These people are quick, however, to imitate the living of people in better circumstances, and if the leaders in these communities are secured for customers, a spirit of rivalry soon springs up and compels them to have their homes equipped as well as their fellow-countrymen.

The children of the immigrant have more luxuries and home comforts than their parents, and appreciate modern appliances and it is often through them that the aggressive central-station salesman finds an opening wedge.

Salesmen must be selected for this class of business who have plenty of perseverance and who have the ability to secure confidence and adjust themselves to treat the immigrant with the same courtesy and attention that would be accorded to the banker or well-to-do storekeeper.

Special inducements, such as giving as a premium a flatiron or an inexpensive portable lamp or any article which will help to beautify the home or lighten labor for the housewife, have been found to give excellent results in getting the small user to install electric service.

A campaign for residence lighting in these communities necessarily entails a great deal of missionary work and the exercise of much patience.

Another thing necessary in securing large quantities of small-residence business is the securing from the wiring contractor a low flat-rate basis per outlet for wiring, which can be advertised generally. With standard wiring prices, the salesman can close all wiring contracts without the aid of the contractor, thereby cutting out a great deal of annoyance and loss of time.

In summing up the best methods for conducting a campaign for the securing of residence business, there are five cardinal points which must be considered: advertising, solicitation, courtesy, enthusiasm and service, and it is my purpose to discuss them briefly.

Advertising.

Under this caption, newspaper advertising naturally is the most important and gives the greatest returns for the amount expended, but it must be handled in a judicious manner, else the money thus spent will be worse than wasted. The copy should be carefully prepared and the writer of "ads." must be careful to stick to his subject, using few words and these right to the point. The heading and the first line or two of the "ad." will be read by practically every newspaper reader, and whether the balance of the advertisement is read or not, depends entirely on the care and skill used in arranging these lines.

Personal letters or circular letters which are facsimilies of personal letters are excellent mediums, as one

[1] Paper presented at convention of Pennsylvania Electric Association, Eagles Mere Park, September 4.

rarely finds a person that will not read a personal letter, even though he may not think he is interested in the subject on which the letter is written There is a subtle flattery in a personal letter which appeals to the average human, and it is on a recognition of this appeal or psychological effect that most successful new-business campaigns are based.

Solicitation.

This method of going after residence business is absolutely essential to success, and if the field is not large enough to warrant the employment of one or more salesmen, then the manager or superintendent should devote a specific amount of time every day to solicitation.

Nothing is quite so effective in securing business as personal contact, and when coupled with judicious advertising, it makes an almost infallible combination.

The selection of salesman is worthy of grave consideration, and care should be taken to pick out men possessing tact, enthusiasm, gray matter and attractive personalities.

Courtesy.

Courtesy on the part of each and every employee of the public-utility company is of most vital importance, both in securing new business and retaining old, and it behooves the manager to instill the necessity of unfailing courtesy, under all circumstances and regardless of irritating conditions, into the minds of every person from the office boy up.

Enthusiasm.

Enthusiasm is the quality which greases the wheels of every successful commercial project, enabling them to overcome friction and perform their duties at the highest possible efficiency.

Enthusiasm as applied to electric service means a firm conviction on the part of the salesman, that he offers the best thing on earth and knows the prospective customer absolutely needs it—whether the said prospective customer thinks so or not. It is the quality which enables the electric-light salesman to overcome the apathy of the prospective customer, the wiles of the gas man and the numerous other obstacles in his pathway to success.

Service.

By service is not meant merely good light, but the term also covers all the other things the consumer pays for and is entitled to: prompt attention to complaints, prompt repairs to defective wiring, prompt investigation of bill complaints and, in fact, prompt attention to everything affecting the relations of consumer and company.

One gains nothing by spending time, money and effort in securing new customers only to alienate their good will by failing to give them proper service.

In the strenuous endeavor to secure new business, we must not lose sight of the fact that the old consumer is worth cultivating, and is well worthy of an occasional call, if only to say "Good morning."

Frequently the old consumer has a little grievance which can be rooted out and adjusted in a short friendly call, but which, if related to his friends and neighbors, will nullify the effect of many hours of earnest effort.

Above all, do not permit your new-business campaign or the conduct of your present business, for that matter, to get into a rut—originality and variety in method will add to results a hundredfold.

New Business for Boston Edison Company.

The following new contracts for electrical service by the Edison Electric Illuminating Company, of Boston, have recently been secured: From the town of Norwood, Mass., which buys energy from the Edison Company for local distribution, an increase of 8,800 50-watt equivalents; Milford & Uxbridge Street Railway Company, 200 kilowatts for the operation of its railway in Dedham, Westwood, Medfield, Medway and Millis; the Carnegie Steel Company, 800 horsepower for the operation of its new plant to be erected in the Allston district; 2,500 equivalents for the United Building Trust, for a new building in Boston; 1,500 equivalents for new building of L. D. Towle at 162 Devonshire Street; 3,600 additional equivalents for the Kimball Building, and 300 kilowatts for the United States Oxygen Company.

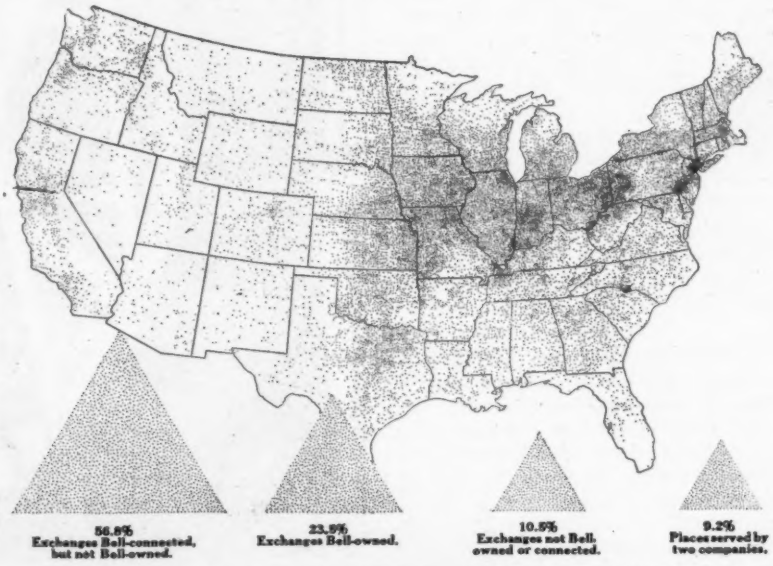
Outing at Menominee.

The employees of the Menominee & Marinette Light & Traction Company held an outing at Menominee, Mich., on September 3. There were athletic contests of various kinds and a baseball game between the representatives of Menominee and Marinette, which was won by the former by a score of 14 to 13. In addition to racing, pole-climbing and pie-eating contests, John H. Peterson gave an exhibition of slack-rope walking.

In the evening 200 people sat down to a banquet given by the company at the Lake Side Inn and this was followed by music and dancing.

Telephone Map.

Every dot on the accompanying map indicates a town where there is a telephone exchange. In all 70,000 places in the United States are reached by telephone service and over 8,000,000 subscribers are connected to the lines.



May Showing Location and Density of Telephone Exchanges in the United States.

The pyramids at the bottom of the diagram show that less than one-quarter of the exchanges are Bell-owned, although more than one-half of them have connections with Bell lines. There are comparatively few points which have two telephone companies giving service and comparatively few exchanges are devoid of outside connections. Over 8,000 different telephone companies have connected their exchanges, so that long-distance service is almost universal.

New Truck for Boston.

The Boston Edison Company has put in service a five-ton electric truck, equipped with an electrically driven winch operated from the truck battery. The work to be done by this vehicle will be the handling

of heavy freight to and from the railway terminals. Points within ten miles of the service buildings will be served, a distance of 25 miles being easily covered on one charge of battery. This will enable it to be used for deliveries in outlying towns, such as Lexington, Newton and Dedham. The truck is particularly efficient for operation in the congested streets of the city.

New York Edison Company Obtains 10,000-Horsepower Contract.

The New York Edison Company has closed a contract with the Flinn-O'Rourke Company, Inc., which is building the new subway tunnels under the East River, to furnish 10,000 horsepower of electrical energy for operation of tunneling equipment. This is the first time in the history of engineering where electric power has been used exclusively for such work.

The first shaft for the tunnels is now being sunk in Jeanette Park and two power plants are in course of erection in which fourteen motors of 600 horsepower each will be installed. It is expected that to complete the tunnels will require three and a half years. The use of electric power will prevent smoke and cinders in the street and also the nuisance of handling large quantities of coal and ashes in a busy thoroughfare. In addition it is expected that much steadier pressure can be maintained in the air locks.

Utilizing Beer-Vat Dryers.

Electric beer-vat dryers have found a place in the motion-picture industry. Recently the Standard Film Company called upon the Yonkers Electric Light and Power Company for service for four of these heating units which were shortly after installed in the drying room of the company's Yonkers studio. It seems that the humidity during the early summer caused a great deal of trouble with the Standard Company's films, retarding the drying process and putting the work behind time generally. Indeed the situation became so grave that "releases" were being made several days late simply because it required seven or eight or even ten hours to complete a batch of films that should have been off the drying drums and finished in half the time.

In desperation the management sought some heating device that would rid the air of moisture and at the same time be absolutely safe when maintained in the same room with thousands of feet of highly inflammable film. The beer-vat dryers were suggested, and four of the 3,000-watt size were secured. These were installed in one end of the drying room and placed in a position so that their heat could be circulated across the surface of the large drying drums.

In the Standard Company's drying room there are four drums, each of which is 27 feet in circumference. These drums are made of laths of soft pine laid several inches apart,, thus permitting the heated air to get into the drum and work on both sides of the films.

The wet films are wound on the drums, emulsion side out, and when all are laden with newly developed photo plays, an electric motor is started and the drums begin to revolve very rapidly. Soon after the motor is in operation current is turned into the beer-vat dryers and heat is circulated across the surface of the films. This new expedient has been found very satisfactory, for the warm air absorbs the moisture in the films and inside of an hour a complete batch of films is dried. Under former conditions it would have taken at least two hours and on humid days from seven to ten hours to do the work. This quick drying process also has the effect of toughening the celluloid, which, if permitted to remain wet more than two or three hours, becomes watersoaked and very easily torn.

An illustration of the drums and dryers is reproduced through the courtesy of the New York Edison Company.

Beer-Vat Dryers Used for Drying Films.

Hotel and Block-Lighting Plant Displaced by Central-Station Service.

The Louisville Gas & Electric Company, of Louisville, Ky., has succeeded in closing another isolated plant, that of the Willard Hotel, at Center and Jefferson Streets. Two 50-kilowatt generators have been operated, furnishing service to six other consumers in the block, whose entire business has now gone to the central station. Besides getting the electric current business of the hotel for lighting and power purposes, the company has also persuaded the Willard to burn gas under its ranges and for heating water. The boilers will be operated for heating purposes during the winter only. Robert Montgomery, of the Louisville Gas & Electric Company, who closed the contract with the hotel, was especially pleased with the elimination of this plant, on account of the block service which it had been rendering.

Campaign to Push Gas-Filled Tungsten Lamps.

The Paradis Company, of Louisville, Ky., has begun a special campaign, in cooperation with the Louisville Gas & Electric Company, on the high-efficiency gas-filled tungsten lamps of the General Electric Company for both interior and exterior lighting. Special attention will be given to exterior work. The lamps which will be featured are the 500 and 750-watt sizes, and the terms of the sale are 25 per cent down and the rest divided into six monthly payments. The cost of the 750-watt lamp for interior use is $12, and for exterior use $14. These figures do not include the cost of wiring.

Electric Sign Data

Notes on Recent Sign Installations.

Indicating a new wide field for electric signs, if the movement is generally adopted, the local branch of the Federal Sign System (Electric) at Cincinnati, O., has made arrangements with the Lubin Theater, a motion-picture house in that city, for the erection of a changeable block-letter sign, similar to those used by other theaters producing the standard dramas, etc. The policy of the house, which is to show two big features weekly, whose names can thus be shown on the sign, enables it to use such a sign as advantageously as does the ordinary theater; and other picture houses following a similar policy, as well as all which show special attractions of this nature now and then, as all of them do, could obviously use such a sign with almost equal advantage. The Cincinnati management of the Federal organization hopes to install a number of motion-picture-theater signs on this basis after the one at the Lubin is erected.

The Capital Electric Company, of Salt Lake City, Utah, is erecting an electric sign for the Broadway Theater, the sign to contain 450 five-watt lamps.

The Federal Sign System will erect a spectacular sign for the Wilson Avenue Theater in Chicago. Above the words "Standard Vaudeville" there will be an attractive sky-rocket burst. This sign will be 10 by 15 feet in size and will be double-faced.

A spectacular waving flag is to be added to the sign already erected in front of the American Theater in San Francisco, Cal. The flag will use 700 tungsten lamps in red, blue and clear glass. The building is also to be outlined with electric lamps and a changeable sign for announcing the titles of new plays will be erected over the sidewalk.

A double-faced sign representing an eagle in a flying position with wings moving up and down is being installed by a retail clothing house on Milwaukee Avenue, in Chicago.

A cigar store in Chicago has put up a sign representing a cigar with a flasher effect, which shows the smoke rising from the cigar in a very realistic fashion. The sign was built by Marx Brothers.

Nearly 12,000 lamps will be used in a sign reading "House of Good Books," which is to be erected in San Francisco, Cal., by the Methodist Book Company. The sign will be two-faced.

A large, new sectional letter sign is being erected by the Federal Sign System (Electric) in front of the Masonic Theater in Louisville, Ky.

The Lyon & Healy Company, well known piano manufacturers of Chicago, will erect a spectacular sign at Park Row and Michigan Avenue in that city. The installation will be made by the Thomas Cusack Company.

This sign is 50 by 60 feet, and contains over 3,000 lamps. It illustrates two soldiers, one a Confederate, the other a Union man. The Confederate blows a bugle, while the Union man beats a drum. There are eight different lines of reading matter, changing every five seconds.

The city authorities of Rock Island, Ill., are familiarizing business houses and sign makers with a new city ordinance regulating electric signs, which will go into effect on December 8 of this year.

Sign makers and dealers are required to deposit a $3,000 bond with the mayor to insure proper installation of signs. All electrical signs must be of metal and must be hung not less than ten feet above the sidewalk, cannot extend more than three feet from the buildings and must be repaired under the authority of the building inspector, according to the newly adopted ordinance.

The Playhouse on Center Street, Rutland, Vt., will have the largest electric sign in that city. The new sign is of steel construction and about 30 feet long, will extend about 15 feet above the building and will be lighted with about 500 lamps. The sign contains the words "The Playhouse" in two-foot letters. It weighs about 800 pounds and will extend about five feet out from the building, being placed directly over the main entrance.

An ingenious and attractive electric sign was recently installed in Butte, Mont. The sign was placed by the Butte Electric Supply Company and is six feet high and 12 feet long. It has seventy 25-watt lamps and is so arranged as to represent a pool play in motion. The player shoots the white ball with his cue and the other balls on the illuminated table roll into the pockets.

Electric sign sketch suitable for retail merchants and others desiring inexpensive installation. Manufactured by the Greenwood Advertising Company, Knoxville, Tenn.

Size of sign is 11 feet 3 inches by 3 feet 6 inches high. The sign is double-faced, using a total of 210 five-watt lamps.

Letters are of 16 and 24-inch size, of the raised vertical script type. Background is of imported glass smalt.

Flashing effect spells out one letter at a time until word is on; then all off and then all on.

Electrical Construction

AN EXPOSED CONDUIT INSTALLATION.

Construction Details of Chicago Bearing Metal Company's Installation.

The Chicago Bearing Metal Company's plant near Forty-third Street and Oakley Avenue, Chicago, Ill., is of modern brick, concrete and steel construction. In the front part of the building two floors are provided, the second floor serving as an office. The shop forms the rear of the building and is built with a gable-type roof, all the steel trusses and columns being exposed.

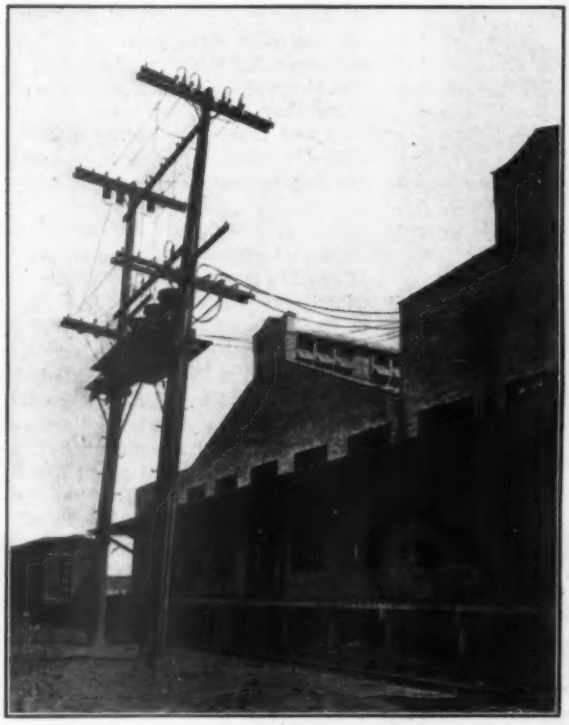


Fig. 1.—Transformers and Service Entrance.

Fig. 2.—Blower-Motor Installation.

Service Entrance.

Power is obtained from the 4,000-volt, three-phase, four-wire mains of the Commonwealth Edison Company, the main being carried underground to the pole structure shown in Fig. 1. One additional conduit is provided for future use, being capped near the bottom of the pole structure. The service conduit is carried to the top of the pole structure where the service cables are led to three single-phase power transformers reducing to 250 volts three-phase for power purposes and a single-phase transformer reducing to 220-110 volts for three-wire lighting service.

Three power cables and three lighting cables are carried from the pole structure to the side of the building where they are anchored to pin insulators. The lighting cables are carried down through a 2.5-inch conduit and led into the building. Two four-inch conduits, each carrying three wires are used for the power service. All of these conduits are supported several inches from the wall by being fastened by U-bolts to a horizontal pipe supported from the wall by brackets. The conduits are carried vertically downwards until several feet from the floor level, where they make right-angle bends and enter the building.

Here the service cables are carried to the service cabinet and the metering board. The service cabinet is of steel and rests upon a pipe stand. A 1,000-ampere, 250-volt three-pole switch controls the power service and a 200-ampere, 250-volt, three-pole switch controls the lighting service. Exposed link fuses are used in this and all cabinets. The metering board is of wood and is mounted above the cabinet. For the power service an induction watt-hour meter and two current transformers are provided as well as a contact-making motor. A watt-hour meter and two Wright demand meters are installed in the lighting mains.

Distribution and Construction Details.

From the board power and light circuits are carried to the various parts of the building. Among the power applications are such machines as motor-driven grinders, air blowers, lathes, sand conveyors, etc. The switches controlling the various motors are all mounted in separate nearby cabinets.

Where conduit runs are carried along the brick walls the heavy conduits are supported by U-straps and the smaller

conduits by conduit clamps. On account of the nature of the steel construction employed numerous special means had to be employed for fastening the conduit runs to the various steel beams and trusses.

Figs. 4, 5, 6, 8 and 9 show some of the methods employed for fastening conduit to beams. Fig. 4 shows a method employed for supporting large conduits on an inverted T-beam formed from two angle irons. The conduit rests on one side of one of the angle irons and is held by an iron strap one end of which is inserted in the space between the angle irons, while the other end is bent so as to rest along the lower edge of the beam. Ordinary perforated iron strap is used for strapping purposes.

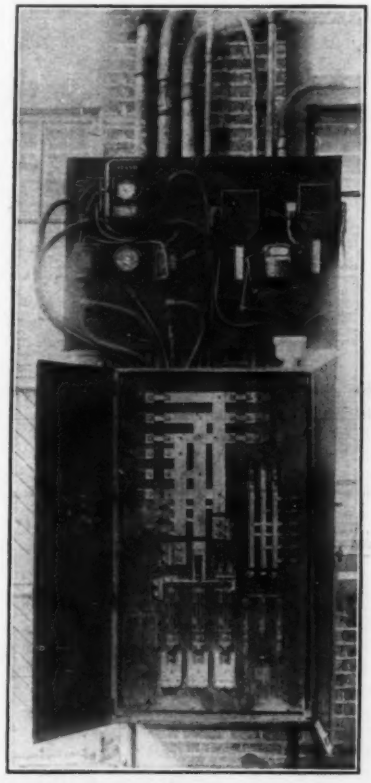


Fig. 3.—Metering and Service Boards.

In Fig. 5 the conduit is shown as hung from an angle-iron structure. In this case perforated iron strap is used again. One end is inserted in the space between the angle irons while the other end is bent around the conduit and fastened by a machine bolt.

As far as possible small sizes of conduit are carried on the under side of the angle-iron beams as shown in Fig. 6. In such cases the conduit is encircled by a conduit clamp which is held by a long machine bolt passed through the opening between the angle irons as shown.

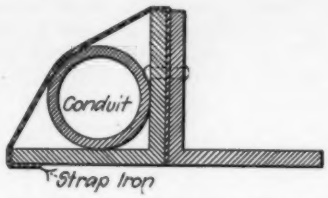


Fig. 4.—Support for Large Conduit.

Fig. 8 shows the method employed for supporting several conduit runs from the ceiling in cases where no other supports were available. It will be noticed that an iron rod of about five-eighths-inch diameter is inserted through holes bored in the steel beams supporting the roof. From this rod perforated iron strap is hung so as to support the upper conduit. Where this strap encircles this conduit run at the bottom a conduit clamp is fastened by a bolt to support the next conduit run. To this clamp another is bolted to support the next run, conduit clamps being added for each additional conduit run.

In some cases another method was used to support such runs. This consisted of carrying the perforated strap vertically downwards and supporting each run of conduit by conduit clamps fastened by horizontally placed bolts to the strap.

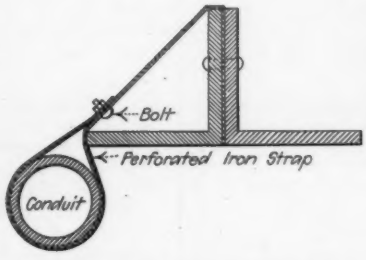


Fig. 5.—Hanging Support for Conduit.

In some cases where a conduit run ran near the ceiling and the nearest support was several inches away, the conduit was supported by a piece of perforated iron bolted to a piece of 0.25-by-1-inch strap iron fastened to a nearby beam and bent so as to permit the conduit to be supported in its proper position.

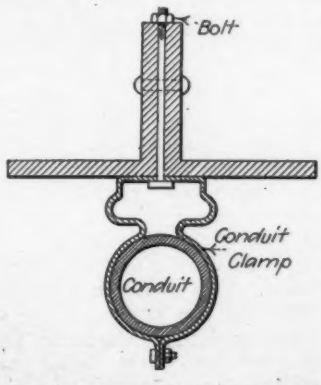


Fig. 6.—Support for Small Conduit.

In other places where suitable support could not be found for the conduits, short pieces of angle iron were fastened in horizontal positions to nearby beams. These angle irons were fastened with one side upwards so as to permit the fastening of conduit to the angle irons by means of U-bolts. To hold an angle iron securely in this position one of the bolts fastening the angle iron to a beam was passed through a space block.

Where outlet boxes had to be fastened to the bottom side of an I-beam or to the bottom side of one of the double angle-iron beams the method employed in Fig. 9 was used. This consisted of screwing the outlet box to an iron strip about one inch in width and about three-sixteenths inch in thickness. Such a strip was bent around a beam in the manner shown, thus furnishing a secure support for the outlet box attached to it. Where a conduit run was located above a beam, the conduit was carried to the outlet box without the use of fittings. This was accomplished by bringing the conduit down close to the beam at a distance of about one foot from the outlet box. A right-angle

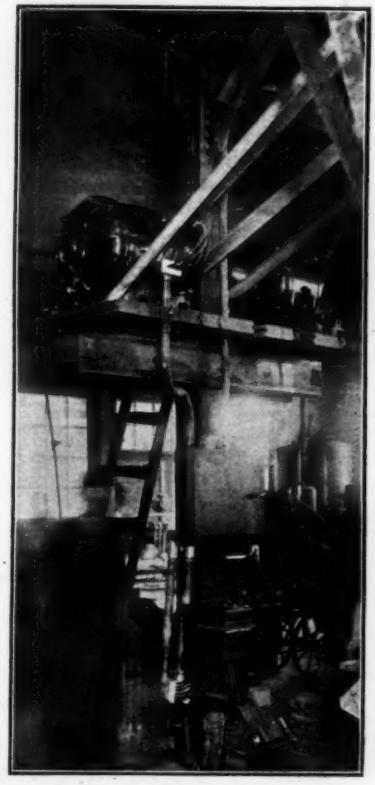


Fig. 7.—Grinder-Motor Installation.

bend was made at the level of the bottom of the beam and the conduit kinked as it passed along the under surface of the beam so as to meet squarely the opening for it in the outlet box. The employing of this method gave a neat bend that kept the conduit close to the beam and at the same time did away with the necessity for fittings. In general it may be said that the electrical contractor, L. H. Lamont & Company, Chicago, Ill., aimed to make all turns as far as possible in the conduit itself.

Where large steel power and light cabinets had to be supported from vertical I-beams bolts passing through the beams and cabinets could not be depended upon for secure support because of the relatively great width of the cabinets. In such cases a cabinet was supported by iron straps about one inch in width and about three-sixteenths inch in thickness, in addition to the bolts passing through the cabinet from the I-beam. Such straps were fastened near the corners of the rear side of the cabinet and carried to the supporting beam, the straps being inclined outwards from each other in all cases. These straps were fastened to the cabinets and beams by means of machine bolts.

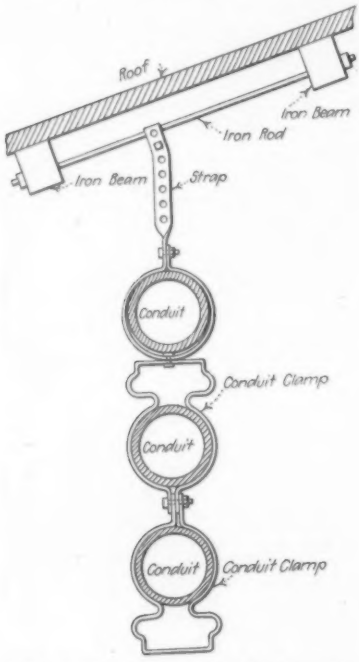


Fig. 8.—Roof-Beam Conduit Support.

The conduits leading to these cabinets were generally fastened to the corresponding I-beam by means of conduit clamps, the bolts of which were carried through a flange of the beam.

The motors belted to the sand conveyors are mounted on the I-beams constituting part of the roof trusses. In order to secure an adequate support for the motors on such a narrow base as the surface of an I-beam, special construction had to be resorted to. These motors were provided with iron belt-tightening bases which aided in the solution of the problem. These bases were bolted to the I-beams in such a way that the motors were located centrally over the beams and so that the base extended outwards from the beams a much greater distance on one side than the other. To the underside of the longer projecting end of each base two heavy iron straps were bolted and carried down so as to rest on the upper side of one of the lower flanges of the corresponding I-beam where they were again bolted. The other end of the base projected only a few inches in each case and no special support was hence required for them. It was at this side of the motor that the conduit was carried along the I-beam. To support this conduit a horizontal strap projecting outwards was inserted between the flange of the corresponding beam and the head of a bolt holding the motor to the beam.

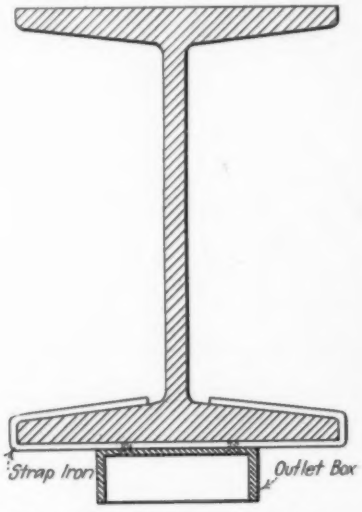


Fig. 9.—Outlet-Box Support on I-Beam.

For motor-driven lathes a separate three-pole switch is provided on the frame of each lathe. These switches are inclosed in iron cabinets which are mounted on strap-iron frames fastened to the lathes. The supply conduits enter these cabinets from the top and the motor conduit from the rear. The motor conduit is bent around the motor frame, in each case being held by conduit clamps.

Fig. 7 shows the grinder-motor installation. Two motors are employed to drive the line shafting. The motors are mounted as shown on an I-beam, wooden bases being used. These bases are supported by a frame composed of horizontal angle irons bolted to the beams and connected by vertical strap-iron bars. Condulets are employed for effecting the turns in the conduits and Crocker-Wheeler induction-motor controllers are used.

Fig. 2 shows the belted motor used to drive a blower furnishing air to the melting furnaces. It will be noticed that a pull box is inserted in one of the overhead conduit runs to facilitate the pulling of cables.

Crane Wiring.

A small electric crane is employed in the shop, the craneway running the length of the shop and provision being made for permitting the crane carriage to travel into the various bays on rails built for that purpose. The crane is supplied with three-phase energy by means of three trolley wires supported to one side of the craneway in one of the usual ways. In the bays the wires are mounted on top of the rails provided for the crane carriage. Two wires are located to one side of the rail and the third wire on the other side. These wires are supported from angle-iron supports at right angles to the rail. The angle irons are approximately 0.25x1x1x15 inches. In this case the angle irons are mounted with one flange horizontal and the other extending vertically upwards. These angle irons are fastened to the carriage rail by bolts passing through space blocks about 1.25 inches in height. The energy for supplying the crane wires is obtained at the end of each carriage

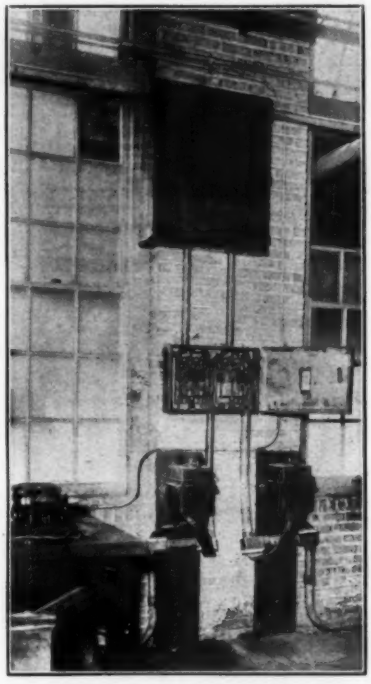


Fig. 10.—Wiring to Motor Starters.

rail in a bay by means of supply conductors carried in conduit near the ceiling and carried down a convenient beam in the same manner, passing through a right-angle condulet to the trolley wires.

Why So Many Contractors Fail.

Eighty-eight per cent of electrical men who enter the electrical contracting field fail for five reasons, according to Frank A. Good, of Louisville, Ky., electrical engineer for F. A. Clegg & Company. In a recent address delivered before the Electrical Clearing House of Louisville, Mr. Good outlined these reasons as follows: They fail because they lack business training, because of their inability accurately to estimate costs on given jobs they undertake, because they engage in or are the victims of unfair competition, because they or their competitors indulge in too much catering to the general contractors, and because they do not take the matter of overhead into their considerations. All of the fifty or sixty members of the Clearing House, which includes practically all the electrical contractors in Louisville, were represented at the meeting and indicated keen interest. Other similar talks are to be made in the near future.

Elaborating the five points he made in beginning his address, Mr. Good pointed out that most of the electrical contractors were graduates from the wiremen's ranks and either had not had opportunity or had not thought it essential to take up a study of the commercial side of the contracting proposition. Being familiar with the practical side of the work they started on the assumption that they were equipped for contracting business, only to find that the best wireman may often make the poorest contractor. A study of the business principles involved, Mr. Good pointed out, was the obvious thing for such men to take up.

Without care in keeping records of jobs done so as to arrive at unit labor-cost averages, the electrical contractor is laying up trouble for himself, Mr. Good pointed out. He may keep figures on the whole labor cost but this will be of little service to him, while it is as necessary for him to estimate down to unit installations of appliances or instruments as it is to make sure that he is not supplying his materials for less than they cost him. More study is needed here, Mr. Good urged.

The electrical contractor does not have to fear first-class competition, according to Mr. Good's views. That is natural and to be expected. It is the competition from the man who will go to suicidal minimum prices in order to get business that is dangerous. This not only works against the contractor so doing but it discredits the industry and makes it more and more difficult for legitimate contractors to get the right kind of business. Such a condition will be corrected, Mr. Good believed, when contractors as a whole get a more comprehensive idea of business.

It is up to the electrical sub-contractor to make a reasonable price and stick to it in his dealings with the general contractor, according to the speaker. The electrical contractors are just as much responsible for allowing the general contractors to use them against each other in peddling bids as are the general contractors for using such methods. Here is where association work can correct a wrong condition.

Finally, the overhead, Mr. Good declared, is usually overlooked by the electrical contractors who fail. Sometimes a gross profit addition to an estimate is large enough to cover, often it means that the net will be a loss instead of a profit. The overhead for each job is liable to differ from every other job and the contractor cannot afford to take any chances here. This furnishes another occasion for study.

Louisville Contractors Co-operate With Central Station.

All the electrical contractors of Louisville, Ky., who are members of the local branch of the National Electrical Contractors' Association, are co-operating with the Louisville Gas & Electric Company's campaign to wire old houses. From the time the campaign began the first of the year until the latter part of the summer all the work, which was solicited on a flat-rate basis by the electric company, was turned over to one contractor. Now the contracts turned in by the men are divided equally by Robert Montgomery, manager of the company's commercial department, among the 15 or so contractors who have entered the agreement with the company.

To insure that there shall be no serious hitches it has been arranged that the contractors shall meet each Saturday at noon with the solicitors for the gas and electric company. They get together around a big table in a room which has been fitted up in the basement of the company's building, and there thresh out all matters on which there is a difference of opinion. In this way the solicitors are schooled and coached on making contracts which will permit the contractors to handle the work with a reasonable profit assured. Whenever a situation develops during the week that Mr. Montgomery or his solicitors do not feel like passing on, decision is reserved until Saturday, when a decision is reached by vote of all the contractors.

When the gas and electric company began the campaign early in the year the contractors other than the one which went into the agreement with the company, did not see fit to come in. Since then, however, the local association has been organized, and now the system has been devised which will insure equal division of the work of this kind, do away with duplicate sets of solicitors in the several shops and mean a fair profit to the trade as a whole. Division of the contracts is entrusted to Mr. Montgomery, who assigns them as they come in, a record, available to the contractors, showing the number and size of the jobs awarded to each man.

Thoroughly harmonious relations and the best of good feeling prevail and increased returns for everybody are expected confidently. Up to the last of August the house wiring campaign had yielded 1,645 new subscribers through the company's own solicitors, involving $71,321.55. This was exclusively for old houses located on existing lines of the company. The solicitors do not touch any new construction work, business houses or factories and do not invade territory just opened up by extensions of the company's service.

Wiring Old Apartment Buildings.

Russell H. Eddy, electrical contractor of St. Paul, Minn., has secured the contract for wiring an old apartment building containing 50 apartments of six rooms each. The building is of brick-exterior and frame-interior construction and is divided into five sections of ten flats each.

Rigid-iron conduit and "Sterling" No. 14 flexible armored cables will be used throughout, all the conduit and cable runs being concealed. The work will be done without taking up any flooring or baseboards and without damaging any decorations. Tenants in each flat will be inconvenienced for only three days for the wiring and for one-half day for fixture work. An eight-day time clock will control all public hall lighting.

This type of wiring is somewhat of a departure from the ordinary type of construction in wiring old flat buildings. As a result of the wiring of these apartments the rents are to be raised about ten per cent, thus showing an increased income for the landlord, a saving in the expense of decorating sooty surfaces, and a more steady income due to the greater desirability of the apartments.

Of the 100 principal cities and towns in Sweden, 72 are lighted by electricity produced by water power.

Municipal Electrical Inspection.

In the issue of September 27, 1913, we published some figures on electrical inspection in a number of the cities of this country, showing the receipts and expenditures connected with this work and the number of inspections. This year an attempt has been made to get more comprehensive figures covering this subject and with this end in view requests for reports from all cities of the country having a population of over 25,000 inhabitants were made. According to the census of 1910 there are 225 such cities in this country, of which 50 have a population of over 100,000. Replies were received in all from 133 cities, of which 37 were from larger cities. Of these Milwaukee has just initiated municipal inspection this year and consequently has no statistics as yet available. In eight of the larger cities inspection is left wholly or in part to the insurance interests. Thus in Philadelphia inspection of ordinary buildings is left to the Philadelphia Fire Underwriters' Association and the 11 municipal inspectors are concerned with motion-picture parlors, theaters, electric signs and outdoor construction. The city inspectors made 60,741 inspections during the year, for which no fees are collected.

In St. Louis, Mo., Scranton, Pa., Buffalo and Rochester, N. Y., there are no municipal inspectors. In Cincinnati there is one municipal inspector, but inspection is left principally to the local Fire Prevention Bureau. In New Orleans there are two municipal inspectors who inspect signs, decorative lighting and similar outside work, but also inside wiring in cases where inspectors of the Fire Prevention Bureau report violations of the city's building code. The two municipal inspectors make about 4,500 inspections per year, for which there is no charge.

In Syracuse, N. Y., the city accepts the certificate of the Underwriters' Association. There is no fee for inspection and the number of inspections per annum is about 3,400. In Providence, R. I., there is a municipal inspector for outside work only, interior inspection being left to the Insurance Association, for which there is no fee.

Of the cities exceeding 100,000 in population from which reports have been received, in which all work must be inspected by municipal inspectors, no fees are charged for either permit or inspections in Baltimore, Md., Fall River, Mass., Kansas City, Mo., Louisville, Ky., Lowell, Mass., Minneapolis, Minn., Newark, N. J., New Haven, Conn., New York City, St. Paul, Minn., and Worcester, Mass. In other cities a charge is made either for permit or for inspection and sometimes for each separately. The amount of this fee is usually dependent upon the size of the installation, there being a schedule which is graduated according to the number of lamps or capacity of motors provided for. In many cases these fees are sufficient to cover the expenses of the inspection department and in some cases they provide additional revenue for the municipality.

TABLE I.—CITIES WITH POPULATION OVER 100,000.

	Number of Inspections.	Fees from Permits and Inspections.	Appropriation.	Number of Inspectors.	Ratio of Fees to Expenses.	Cost per Inspection.	Number of Inspections per Inspector.
New York, N. Y.	209 705	[illegible]	$125,000	[illegible]	[illegible]	[illegible]	2,995
Chicago, Ill.	117,908	193,286	92,948	45	2.1	0.78	2,680
Boston, Mass.	[illegible]	4 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3,650
Cleveland, O.	25,495	14,096	13,900	7	1.0	0.55	3,650
Pittsburgh, Pa.	31,484	11,450	12,672	9	0.90	0.40	3,498
Detroit, Mich.	56,700	21,452	18,829	10	1.1	0.33	6,300
San Francisco, Cal.	17,042	15,237	12,700	6	1.2	0.75	2,840
Newark, N. J.	6,579	0	5,200	3	0	0.79	2,193
Washington, D. C.	14,220	5,462	7,600	5	0.70	0.56	2,844
Los Angeles, Cal.	42,000	47,817	28,039	11	1.7	0.67	4,200
Minneapolis, Minn.	20,125	0	8,700	5	0	0.43	4,025
Kansas City, Mo.	15,000	0	8,500	4	0	0.57	3,750
Louisville, Ky.	4,000	0	.....	2	0	0.7	2,000
Denver, Colo.	6,904	8,662	6,000	3	1.4	0.87	2,300
Portland, Ore.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,220
Toledo, O.	5,706	4,175	5,338	3	0.78	0.93	1,902
Oakland, Cal.	12,818	9,507	11,460	5	0.83	0.90	2,560
Worcester, Mass.	12,000	0	3,348	4	0	0.28	3,000
New Haven, Conn.	2,000	0	2,000	1	0	1.00	2,000
Birmingham, Ala.	6,000	6,000	4,140	3	1.45	0.69	2,000
Omaha, Neb.	6,844	6,849	7,561	4	0.90	1.10	1,711
Fall River, Mass.	1,142	0	1,175	1	0	1.03	1,142
Nashville, Tenn.	2,811	2,000	2,400	1	0.84	0.85	2,811
Spokane, Wash.	7,687	3,988	5,700	3	0.70	0.74	2,562

The ratio of receipts to expenses varies from 0.065 in Boston, where there is a fee of 50 cents for a permit and none for inspection, to 2.1 in Chicago, where the inspection fees run up to large figures in the case of large installations. About $100,000 above expenses are annually turned into the treasury of the latter city. The inspection department in Los Angeles, Cal., is also a revenue earner for the city and shows a surplus of nearly $20,000 for the year. In most of the cities charging fees, however, receipts are more nearly equal to the expenses and in many cases slightly less. The ratio of receipts to expenses, with the exception of the cases already mentioned ranges between 0.70 and 1.45.

The cost per inspection in the large cities shows a range from $0.28 in Worcester, Mass., to $1.10 in Omaha, Neb. The extremely low figure in Worcester appears to be due to the very low salaries paid the inspectors. With this exception there is no cost lower than $0.40 and the values lie principally between the latter figures and $1.00. The number of inspections made by each inspector per year varies for a large number of cities between 2,000 and 3,000. In Omaha it falls to 1,711, which probably accounts for the high figure for the cost per inspection in that city. The number of inspections made in some cities per inspector almost surpasses belief, Detroit claiming an average of 21 inspections per day in that city. It is hard to see how adequate inspections can be made at this rate.

Table I shows the actual figures for a number of cities over 100,000 in population. These figures apply to a fiscal year, usually the calendar year 1913. The exact cost of conducting the department of electrical inspection cannot always be segregated from other municipal expenses, and the figures given for this item are in some cases only approximate. Portland, Ore., is credited with 4.5 inspectors because one of the men served only a half year.

Table II, which has been compiled by W. A. Davis, electrical inspector of Spokane, Wash., gives some additional information which will be of interest in connection with municipal electrical inspection.

TABLE II.—SALARIES IN INSPECTION DEPARTMENT OF VARIOUS CITIES.

	Salary of Chief Inspector.	Number of Assistants.	Salary of Assistants.	Number of Clerks.	Salary of Clerks.	Are Fees Charged.
Denver	1,800	12	1,200	1	1,200	No
Detroit	1,500	13	1,000 to 1,200	4	720 to 1,000	Yes
Grand Rapids	1,500	2	1,200	1	1,000	Yes
Kansas City	1,800	4	1,080	2	720	Yes
Los Angeles	1,800	11	1,380	5	840 to 1,380	Yes
Minneapolis	1,800	3	1,300	1	1,200	No
Oakland	1,800	4	1,680	2	900 to 1,680	Yes
Portland	1,800	5	1,380	1	1,200	Yes
San Francisco	1,800	5	1,500	1	1,200	Yes
Seattle	2,400	7	1,320	1	1,080	No
Spokane	1,800	2	1,500	1	1,200	Yes
St. Paul	2,400	1	1,140	1	...	No
Tacoma	1,380	3	1,080	1	1,200	No
Toledo	1,500	2	1,200	1	900	Yes

Cities Under 100,000.

Of the 96 cities having a population of less than 100,000 which responded to the request for information, there are 12 which have no electrical inspection and 18 in which inspection is carried out only by some organization connected with the insurance underwriters. The latter condition is quite common in some states, such as New York, Pennsylvania, Ohio and Kentucky. In Shreveport, La., the inspector of the Louisiana Fire Prevention Bureau has been appointed electrical inspector by the city. There is no cost to the city for this inspection work and no fees are charged by the Bureau.

In Massachusetts there is a state law requiring each town to appoint an inspector of wires, but this office is sometimes combined with that of city electrician, superintendent of fire alarms, etc.

In 66 cities there is inspection by municipal inspectors and of these 27

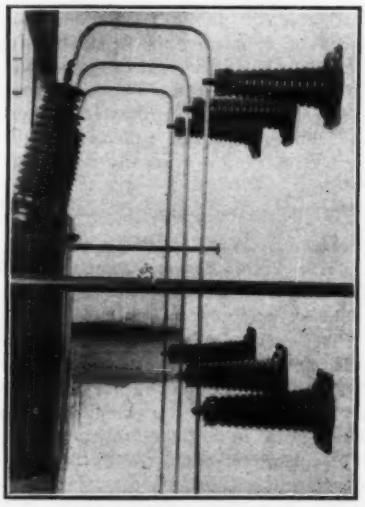


Fig. 1.—High-Tension Wiring in 66,000-Volt Substation.

charge no fee for either inspection or permit. The larger number of these cities make some charge. In some cases a single fee covers both permit and inspection, and in others a separate fee is charged for each. There seems to be a general inclination to make inspection departments self-supporting by having the fees sufficient in amount to cover the expense of the work. In some cases the receipts are less than the expenses and in other cases they are greater, but in only four cities is the excess of receipts over expenses as much as $500. Of these four, Des Moines, Iowa, and San Diego, Cal., clear about $3,000 each; in Peoria, Ill., the surplus is about $1,400; and in Pasadena, Cal., it is less than $1,000.

In most cities of this class there are either one or two inspectors, but a few have a larger number. Thus there are four in Tacoma, Wash., and three each in Des Moines, Iowa; Jacksonville, Fla.; New Bedford, Mass.; and San Diego, Cal. The inspections made per inspector show considerable variation, as is to be expected where the number of inspectors is small, the minimum, of course, being as low as the smallest number of inspections made for any town per annum. On the other hand, certain cities report very large figures. Duluth, Minn., for instance, reports 3,160 inspections by one man; Pasadena, Cal., 5,226 by two men, and San Diego, Cal., 12,726 by three men. The maximum, however, is reported by Brookline, Mass., which claims 23,000 inspections by two men. It seems evident here that this figure does not apply to the number of premises examined, but more likely the number of lamp outlets or similar units.

Running High-Voltage Conductors Indoors.

The precautions necessary in mounting high-voltage conductors inside buildings illustrate in an interesting manner the difference between old and new methods of construction in the electrical field. In the days of low or moderate-voltage service the disposition of wiring within buildings was a very simple matter mechanically and a comparatively easy task electrically. The advent of transmissions of from 60,000 volts upward has practically revolutionized this class of work. Fig 1 shows the importance of clearance and the rugged type of insulator required under present conditions in a city substation into which a 66,000-volt line is brought from a neighboring hydroelectric system. In this substation the transformers are located on the floor below the high-tension oil switches.

In order to carry the conductors safely from the switches to the lower floor the designers cut an opening about five feet wide in the switchroom floor, mounted the conductors as shown on insulators of more than a dozen sections each, and dropped them vertically through the opening, safeguarding the conductors and the opening by railings. Brass rods are used instead of wires on account of their superior rigidity. The oil switches used on high-voltage lines are equally rugged, some being taller than a man, although their electrical task is no more complex than that of a lamp-socket switch, speaking purely of circuit requirements. Short runs, wide spacing and absolutely clear arrangement are striking features of first-class interior wiring for very high-voltage service.

Window Display of Comparative Lighting Economy.

The Reuter Electric Shop, of Cincinnati, O., demonstrated very effectively in a well arranged window display last week the economy of the Mazda tungsten lamp by comparing the cost of the 16 candlepower of light given by a 20-watt lamp with the same illumination from other sources.

Sixteen wax candles constituted the first item of the display; these were grouped together with a card referring to them as "Noah's arc lights," and pointing out that their cost for an hour's lighting was 12 cents. Next in order of economy and efficiency came three oil lamps, necessary to give 16 candlepower, at a cost of one-third cent an hour, with the serious objections, as pointed out by the card behind them, of dirt, inconvenience and danger. The ordinary carbon incandescent lamp was shown, as admittedly a modern illuminant, but less so than the tungsten, which affords the amount of light referred to at a cost of only one-fifth of a cent an hour.

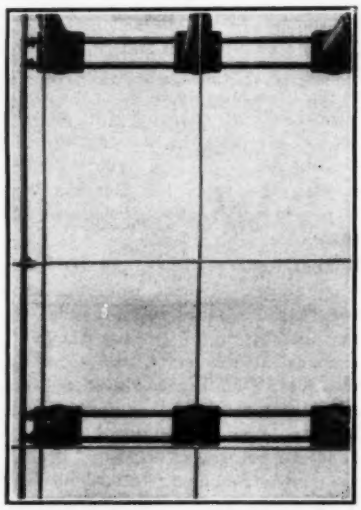


Fig. 2.—View of High-Tension Wiring, Looking Up Toward Ceiling.

This display attracted considerable attention on account of its novelty, and thus had a good chance to get in some convincing work.

Among the Contractors.

A. S. Shulman, electrical contractor of Chicago, Ill., has the contract for wiring the Chicago Telephone Company's Harrison Exchange building at 529 Federal Street, for some additional light and power circuits.

The Electric Construction Company, of Trenton, N. J., has been awarded the contract for wiring the municipal filtration plant for light and power, and also the contract for remodeling the wiring in the city pumping station. The bid, which was the lowest, amounted to $3,836.

The L. K. Comstock Company, Chica-

go, Ill., has the contract for wiring the Lumber Exchange Building in that city. Over 5,000 lamps and numerous motors will be installed.

The United Electric Construction Company, of Chicago, Ill., is wiring the Sabin School building at Leavitt and Hirsch Streets, Chicago.

The Inter-Mountain Electric Company, of Salt Lake City, Utah, has a contract to complete the wiring and to install fixtures for the Emanuel Methodist Episcopal Church at Second South and Fourth East Streets.

The Capital Electric Company, of Salt Lake City, Utah, has been awarded the contract for installing the electric conduit and wiring in the new Dee-Eccles Building now in course of erection. The entire top floor of the building will be devoted to a dance hall, 90 by 120 feet, which will be lighted entirely by indirect cove lighting. The company has also secured the contract for the interior wiring and fixtures for Alhambra Theater at Ogden, Utah; this also includes the stage switchboard, dimmers, border and foot lights, and stage lighting equipment.

R. C. Reeder, of Ashland, Ky., will engage in the electrical contracting business at Roanoke, Va.

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Merchants Heat and Light Company. Protests have been heard before the Commission against the company's basis of charging for heating service. Decision in the matter will be withheld until the general order involving the rates for electric light and power and heating service in Indianapolis.

Annual Report—Rates. In the issue of September 5, brief reference was made to the Commission's annual report. In this, in discussing the electric rates in the state, the Commission says: "These schedules are not easily interpreted. It appears that 25 Class A light plants have filed schedules of rates. These disclose that Laporte has a 12.5-cent rate for domestic consumers. This appears to be the highest rate in the state. Jeffersonville and New Albany follow with a 12-cent rate. The city of Anderson has a 6-cent rate. This is the lowest in the state for lighting purposes. Evansville has a 7.5-cent rate, which is the lowest furnished by any privately owned plant in the state. By term contracts Indianapolis plants sell at a 7.5-cent rate, but not otherwise.

"Laporte has a power rate graduated to 0.84 of a cent. This is the lowest given. A number of cities have a power rate of one cent. These low rates for power are for very large consumers only. Every city but Anderson appears to have a minimum bill.

"Of the 60 Class B cities, Auburn and Frankfort have a 12-cent rate. This is the highest in the state in this class. Boonville has a 7-cent rate, which is the lowest in the state in this class. Clinton and Crawfordsville have a one-cent power rate, which is the lowest in the state in this class. This is for large consumers only; 46 of Class B cities have a minimum bill.

"There are more than 200 Class C towns in the state, for which rates have been filed. Cayuga, with a 20-cent rate, is the highest in this or any other class. Knox, with a 14-cent rate, Goodland with a 13-cent rate, and Carthage, Danville and Cloverdale each having a 12.5-cent rate, follow. Hobart, with a private plant, and Jasper, with a municipal plant, each have a 6-cent rate, which is the lowest in its class. A number of towns have a power rate graduated to 1.5 cents. About 160 of these have a minimum bill."

NEW YORK.

The Central Hudson Gas & Electric Company was granted permission by the Second District Commission to extend its system and to furnish service under two new franchises, one in the town of Wappingers, Dutchess County, and the other in the town of Hamptonburgh, Orange County. In the case of the extension in Dutchess County, the Commission allows the new extensions only where they do not interfere with the established business of supplying electric current to the public by the Garner Print Works and Bleachery.

OHIO.

Valuation Order. The Commission has ordered that every public utility of the state must file with the Commission, before January 1, a certified valuation of all its properties.

PENNSYLVANIA.

Rules of Practice. The Public Service Commission has issued a pamphlet of the rules of practice adopted by the Commission December 2, 1913, revised August 5, 1914.

The Citizens' Electric Illuminating Company. The Commission issued a certificate of public convenience and necessity approving the street-lighting contract of the Citizens' Company with the City of Pittston. The Consumers Electric Company protested against the approval of the contract but the objections of this company were overruled.

WISCONSIN.

Berlin Public Service Company. The Commission has ordered a readjustment of the company's rates.

The Berlin Public Service Company was authorized to issue $10,500 of bonds to be exchanged for a similar amount of notes outstanding. This issue was authorized in accordance with an agreement made by the Commission in authorizing the issue of the notes originally.

The Bark River Electric Light & Power Company was authorized to issue $14,600 of stock and $7,500 of bonds for purposes as follows: $8,100 of stock to replace void stock issued in ignorance of statutory provisions requiring the Commission's approval; $6,500 of stock to be given in exchange for a water power and water-power site; $1,500 of bonds to be used for discharging outstanding indebtedness on account of previous construction; and $6,000 of bonds to be used in building a mill, and installing machinery and equipment.

The Utica Telephone Company was authorized to issue $5,000 of stock in order that the total of its stock, bonds, and notes outstanding might be brought to an equality with the value of its telephone property.

The Springfield Farmer's Telephone Company received the Commission's authority to issue 15 shares of stock of par value of $40, part of the proceeds of which are to be used in making extensions.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 2.

Two tungsten lamps, L_1 and L_2, are connected to a lighting circuit as shown in Fig. 2.

The resistance of L_1 is 150 ohms and the resistance of L_2, 250 ohms. Each of the conductors connecting the lamps to the service entrance has a resistance of 0.2 ohm. The voltage between the wires at the service entrance is 115 volts and is constant, independent of the current.

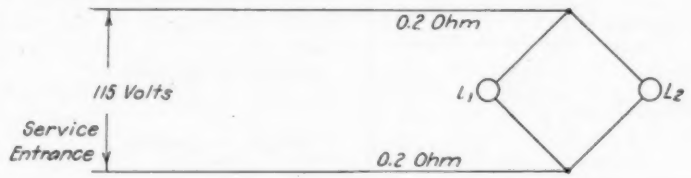


Fig. 2.

Find (a) the joint resistance of the two lamps; (b) the total resistance of the circuit inside of the service entrance; (c) the current in the conductors; (d) the voltage at the lamps; (e) the current in L_1 and (f) the current in L_2.

SOLUTION OF PROBLEM 2.

The two lamps, L_1 and L_2, are said to be connected in *parallel*. A parallel connection differs from a series connection in that the current flowing into a parallel circuit is divided, the respective currents in its component parts may be different and the potential difference between the ends of the component parts must be the same. The reciprocal of the joint resistance (R_0) of a parallel circuit equals the sum of the reciprocals of the resistances (R_1, R_2, R_3, etc.) of the respective branches provided no branch of the parallel circuit contains an emf. If one or more of the branches contains an emf., the joint resistance of the parallel circuit cannot be determined. The formula for the joint resistance in the case of no emf. in any branch follows:

[7] $1/R_0=1/R_1+1/R_2+1/R_3$, etc.

When there are only two branches in a parallel circuit [7] reduces to:

[8] $R_0=R_1 R_2/(R_1+R_2)$

In the case of (n) parallel branches of equal resistance (R), [7] reduces to

[9] $R_0=R/n$.

Answer to Question a.

By [8] $R_0=250\times150/(250+150)=93.7$ ohms.

While the two lamps, L_1 and L_2, in their relation to each other are connected in parallel, a single resistance of 93.7 ohms may be substituted for them, making a series circuit which is equivalent to that shown in Fig. 2. The total resistance may then be calculated by formula [2].

Answer to Question b.

By [2] $R_0=0.2+93.7+0.2=94.1$ ohms.

Answer to Question c.

Since the total resistance of the circuit shown in Fig. 2 is known and the potential difference across its terminals is given and is stated to be constant, independent of the current, the current (I) is:

By [6] $I=115/94.1=1.22$ amperes.

Answer to Question d.

The potential difference at the lamps may be obtained by either [4] or [5].

By [4] $V=1.22\times93.7=114.5$ volts.

By [5] $V=115-1.22\times0.4=114.5$ volts.

Answers to Questions e and f.

The potential difference at the lamps is known to be 114.5 volts. Hence, the current in L_1 is:

By [6] $I=114.5/150=0.76$ ampere.

Similarly, the current in L_2 is:

By [6] $114.5/250=0.46$ ampere.

A check upon answers to e and f is obtained from the fact that the total current (I_0) flowing *toward* any junction equals the sum of the respective currents (I_1, I_2, I_3, etc.) flowing *away* from that junction, or

$I_0=0.76+0.46=1.22$ amperes, which is in agreement with the facts.

The currents in L_1 and L_2 might have been obtained from the fact that the currents (I_1 and I_2) in two parallel branches, *each containing no emf.*, vary inversely as the respective resistances (R_1 and R_2) of the branches or

[10] $I_1/I_2=R_2/R_1$

and, applying the principles of ratio and proportion,

[11] $I_1/I_0=R_0/R_1$ and $I_2/I_0=R_0/R_2$

In Fig. 2, for example,

By [11] $I_1/1.22=93.7/150$ or $I_1=0.76$ ampere.

By [11] $I_2/1.22=93.7/250$ or $I_2=0.46$ ampere.

SOLUTION OF PROBLEM 52.

Determination of load constants.

Output of motors$=50.2$ h. p.
$=50.2\times746$ watts.
$=37{,}450$ watts.

Input to motors$=37{,}450\div0.82$
$=45{,}670$ watts.

By [1a] Current$=45{,}670/(220\times0.85)$
$=244$ amperes.

By [4a] R of load$=45{,}670/244^2$
$=0.766$ ohm

ALTERNATING CURRENTS.

Problem 52.

A number of small single-phase, 220-volt, 60-cycle motors are jointly delivering 50.2 horsepower at a combined efficiency of 82 per cent and a power-factor of 85 per cent. They are supplied with power from a source about 700 feet away over a circuit of No. 000 conductors which has a total resistance of 0.0936 ohm and an inductance of 0.321 milhenry. The pressure at the source is adjusted so that the motors operate at their rated voltage and frequency. (a) What is the total equivalent resistance of the line and the motor load; (b) What is the total equivalent reactance of the same; (c) What is the total equivalent impedance of the same; (d) What is the total voltage drop in the line conductors; (e) What is the necessary line pressure at the source; (f) What is the power loss in the line conductors; (g) What is the power-factor measured at the source of supply?

DIRECT CURRENTS.

Problem 3.

Two direct-current generators supply power to a group of 100 lamps as shown in Fig. 3.

The e.m.f. induced in No. 1 equals 118 volts, while the e.m.f. induced in No. 2 equals 116 volts. The resistance of generator No. 1, between terminals, is 0.02 ohm, and the resistance of No. 2 is 0.01 ohm. The resistance of each conductor connecting the lamps to the generators is 0.01 ohm. The lamps are connected in parallel, each lamp having a resistance of 100 ohms. The resistance of the conductors between the generator terminals is negligible and the field currents are neglected.

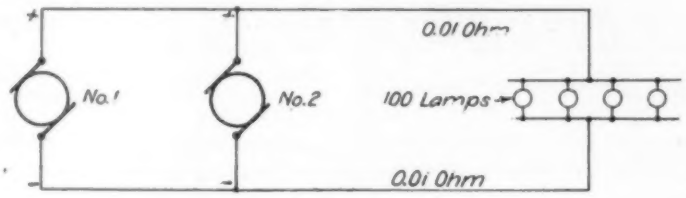


Fig. 3.

Find (*a*) the armature current in generator No. 1; (*b*) the armature current in generator No. 2; (*c*) the total current taken by the group of lamps; (*d*) the terminal voltages of generators No. 1 and No. 2, and (*e*) the voltage at the lamps.

This problem is given to illustrate the principles involved in a series-parallel circuit when one or more of the parallel branches contain sources of e.m.f.

ALTERNATING CURRENTS.

Problem 53.

A small single-phase plant supplies power at 1,180 volts to two sets of feeders. The first of these receives 247 kilowatts and the second, 183 kilowatts. The current supplied to the first is 279 amperes and to the second 163 amperes. (*a*) What is the equivalent admittance of the first load; (*b*) what is the equivalent conductance of the same; (*c*) what is the equivalent susceptance of the same; (*d*) what is the total equivalent conductance of both loads; (*e*) what is the total equivalent susceptance of both loads; (*f*) what is the total equivalent admittance of both loads; (*g*) what is the total current supplied by the plant; (*h*) at what power-factor is the plant operating.

This problem illustrates the principles of parallel circuits.

Solutions of the above problems and two new problems will be printed in the next issue.

By [3a] Z of load=220/244
=0.902 ohm

By [5a] X of load=$\sqrt{(0.902^2-0.766^2)}$
=0.475 ohm

Answer to Question a.

For a series circuit, the total equivalent resistance is equal to the sum of the equivalent resistances of its parts.

[8a] $R_e=R_1+R_2+R_3$, etc.
$R_e=0.766+0.0936$
=0.860 ohm.

Answer to Question b.

The reactance of a circuit is 6.28 times the frequency and times the inductance expressed in henrys.

[9a] $x=6.28\ f\ L$

Since 1 milhenry equals 0.001 henry the reactance of the line conductors is:

$x=6.28\times60\times0.321/1,000$
=0.121 ohm

Reactance due to inductance is a positive quantity.

For a series circuit the total equivalent reactance is equal to the algebraic sum of the equivalent reactances of its parts:

[10a] $X_e=X_1+X_2+X_3+\ldots\ldots$
$X_e=0.475+0.121$
=0.596 ohm

Answer to Question c.

By [5a] $Z_e=\sqrt{(R_e^2+X_e^2)}$
$=\sqrt{(0.860^2+0.596^2)}$
=1.046 ohms

Observe that the total impedance is not the sum of the impedances of the line and the load.

Answer to Question d.

By [5a] Z of line=$\sqrt{(0.0936^2+0.121^2)}$
=0.153 ohm

By [3a] E (line drop)=244×0.153
=37.3 volts.

Answer to Question e.

By [3a] E (at source)=$I\ Z_e$ (See question c).
=244×1.046
=255.4 volts.

Observe that the line pressure at the source is *not* equal to the pressure at the load plus the drop in the line conductors.

Answer to Question f.

By [4a] P (line loss)=$244^2\times0.0936$
=5,580 watts.

Answer to Question g.

This result may be obtained in two ways, either by formula [2a], or by formula [6a]. The power loss in the line is 5,580 watts (see question *f*), and the power delivered to the motors is 45,670 watts. The total power delivered to the line at the source is the sum of these two and is 51,250 watts. The current is 244 amperes, and the pressure at the source of supply is 255.4 volts.

By [2a] $PF=51,250/(255.4\times244)$
=0.822.

By [6a] $PF=R_e/Z_e$
=0.860/1.046
=0.822.

Observe that the power-factors at the source of supply and at the load are *not* the same.

Johnstown to Supply Power to Large District.

Somerset County, Pa., is the scene of great activity along electrical lines. The Penn Electric Service Company, which has absorbed a number of smaller concerns in Somerset and adjoining counties during the past few years, is bending its energies toward the completion of high-tension transmission lines. These lines will carry current for light and power over a large circuit which will include many of the principal towns of the country. The construction of these lines means that the city of Johnstown will grow enormously as an electrical center in the next year or two. The Penn Company's Johnstown plant will generate all the current for the Somerset County loop and when enlarged to supply the heavy demands on the Somerset line will be one of the largest power stations in the state. Somerset town will ultimately get its electric light from Johnstown, according to the company's plans, when the local plant will be abandoned.

BOOK REVIEW.

"Insulation and Design of Electrical windings." By A .P. M. Fleming and R. Johnson. London: Longmans, Green & Company. Cloth, 224 pages (5½x8¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $2.25.

The book which constitutes the subject of this review will be of much use to engineers in proportioning the insulations for electrical machinery. Of the seven chapters, the third, entitled "Insulating Materials," is much the most important.

Throughout the book *C* is used for current, whereas there is now general agreement on the employment of *I*. In Fig. 4 on p. 10, ordinates are stated to be volts, whereas they should have been stated to be kilovolts. At the top of p. 12 recommendations are made as regards the required exactness of the surface of spherical electrodes when employed for sphere gaps. These recommendations and the spark-gap distances given in Fig. 4 on p. 10, and the further text on p. 14 should, in future editions, be compared with the recommendations and values given in Sections 267 to 276 inclusive of the 1914 A. I. E. E. Standardization Rules. On p. 35, in discussing the case of several layers of materials of different specific inductive capacities when placed in an electrostatic field, it would have been desirable to emphasize the importance, in slot insulations, of employing materials of low specific inductive capacity in order to decrease the stresses on any unavoidable air layers and crevices. In Chap. II the significance of graded insulation for extra-high-pressure transformers is made very apparent.

In Chap. III, entitled "Insulating Materials," stress is rightly laid on the considerable percentage of moisture normally present in most insulating materials, but, in the opinion of the reviewer, the authors are slightly in error in indicating that it is undesirable to reduce this quantity of moisture to a great extent. The authors do not appear to sufficiently appreciate the suitability of the insulating impregnations for supplying the desirable characteristics for which water otherwise provides. Throughout the book the limiting values of the temperature indicated by the authors are rather lower than, with the modern knowledge of the art of insulating, can be employed with entire success. Suitably constructed moisture-free, solid-filled insulations are immune from deterioration when operated at temperatures much in excess of those considered by the authors to be limiting. On p. 64 the authors are too reassuring in their statements with regard to the "green discoloration" often noticed on windings which have been impregnated with certain kinds of varnish. It is dangerous to conclude that the corrosive effect, of which the green discoloration is an evidence, will, in all cases, arrest itself before harm is occasioned.

While it is realized that nowadays the use of shellac in electrical work cannot be sweepingly condemned, nevertheless, an incorrect impression is liable to be occasioned by the repeated occurrences of statements in which its use is recommended.

The authors do not lay sufficient stress upon the details necessary to insure that compounds shall thoroughly impregnate windings of large cross-section to their innermost parts. To accomplish this successfully requires much greater care than would be judged from the authors' descriptions and, in view of the fact that thoroughness in this process is of the utmost importance, it is often well to consider employing alternative processes, whereby varnishes are applied during the process of winding, as giving more positive assurance of complete impregnation. The authors do not set up a sufficiently high requirement in the matter of the temperatures below which compounds must not soften in order to meet modern conditions. Similarly, it is hardly sufficient that transformer oils shall be liable to the formation of deposits, if maintained continuously at a temperature of only 80 degrees. A suitable transformer oil should be capable of continuous operation at a temperature of at least 90 degrees without deterioration, and in Germany, 95 degrees is considered to be the appropriate value.

In discussing manila paper the authors point out, that when this is made from rope, there is sometimes a liability to the presence of metallic particles, since the ropes from which such papers may be made, are liable to have been used for slings and rope drives in locations where fine particles of iron are thrown about. It would have been well if, in treating of asbestos, mention had been made of the importance of testing for the presence of metal particles, and avoiding grades in which these have not been reduced to a negligible amount.

It is remarkable that in this chapter on Insulating Materials, no mention whatsoever is made of bakelite, or of any similar synthetic product. Since such materials play a vastly important part in modern electrical machinery, they ought to have come in for thorough treatment.

On p. 116 the authors state that "the cost of insulating materials used bears only a small proportion to the total cost of the apparatus." This is not the case in a large percentage of all modern electrical machinery. On pages 118 and 119, the statements as regards the temperature limits established by the German and American Standardization Rules are no longer correct. In both countries these Rules have been revised.

The use of enameled wires is mentioned, but is dismissed in about eight lines, an amount of space utterly incommensurate with its importance. Another paragraph relates to oxide insulation for bare aluminum wire and includes the following sentence: "It is particularly useful for railway motor field coils where the temperature of the windings reaches a high value." The reviewer has followed the progress in this line and considers this unqualified statement to be dangerous.

In the discussion of moisture in Chap. VI, the authors do not mention the cleaning and cooling of air by wet filters and the probable influence on developments in electrical machinery design. This is an important point which could with advantage have been dealt with thoroughly. H. M. HOBART.

Ohio Meter Committee.

The Meter Committee of the Ohio Electric Light Association, of which A. H. Bryant, of Cleveland, is chairman, has planned to hold three conferences during the year as follows: at Dayton, October 23; at Newark, January 22; at Sandusky, April 23.

The Executive Committee of the Association at a meeting last August indorsed the plans of Chairman Bryant, which include the preparation of uniform meter records for the member companies, with visits to the smaller companies that need direction and assistance in the care, upkeep and records of their meters. An appropriation of $100 in addition to the expenses of the conferences was made for the purpose of enabling the Committee to procure the data necessary for the preparation of uniform meter accounts.

An important feature of the conferences will be the general discussion on open questions. To further meet the needs of the members regarding questions and answers thereto the Committee proposes to conduct a Question Box in the *O. E. L. A. Monthly*. Conference programs will be in charge of John K. Himes, of Dayton, and Mrs. R. F. Allan, of Columbus. Arrangements for the meetings will be in the hands of George E. Snyder, of Toledo.

At the meeting of the Executive Committee, above mentioned, S. E. Doane, of Cleveland, was made chairman of the Committee on Standard Voltage.

Copper Exports.

Exports of copper for the week ending September 10 totaled 4,335 tons; since September 1, 5,600 tons; same period last year, 12,325 tons.

Chicago Jovians Hear About Electrical Opportunities.

The first fall meeting of the Chicago Jovian League was held in the Crystal Room of the Hotel Sherman at noon on Monday, September 14. Reports relating to the plans for the entertainment of visiting Jovians and for the participation of the Chicago Degree Team in the contest at the St. Louis convention were presented respectively by Walter E. Bischoff and George C. Richards. Jovian Statesman Homer E. Niesz exhorted all members present to remember Jovian Day and explained the arrangements which had been made with respect to the providing of a special train to take Chicago Jovians to the annual convention which will be held at St. Louis, October 13 to 16.

Arrangements had been made for the appearance of several speakers of national prominence to present authentic information with regard to the opportunities for the greater utilization of electrical apparatus in South and Central America and in the Orient, and also to discuss the opportunities for a greater utilization of current-consuming devices in the United States. Owing to a series of uncontrollable circumstances these speakers could not be present and A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, was called upon to make the address of the day. Mr. Gray had been in close touch with the situation at large for several months and as a result of an extended trip and intimate contact with the leaders in a great many industries was able to present a general review of the present situation, particularly with regard to the further use of electrical material in this country.

Mr. Gray first sketched briefly the necessity for a thorough understanding of the obstacles which were present in an over-night conquest of foreign trade both in South and Central America and in the Orient. He suggested that the American manufacturer would work out for himself a considerable portion of grief if it were merely attempted to translate the usual catalog and circular into Spanish and Portugese or other foreign language and depend upon ordinary representation for the establishment of a trade connection. The consensus of opinion of the best informed experts with regard to opportunities for establishing a foreign market for American products indicates that the greatest degree of patience must be exercised. A considerable amount of money must be expended and only a representative thoroughly familiar with the language and customs of the people in the foreign countries could hope to secure a favorable entree, and a business connection which would be of an enduring character could be built up only after a great deal of missionary effort and satisfactory performance of initial service.

It was with regard to opportunities in the United States that Mr. Gray laid his greatest emphasis. As a result of considerable traveling and coming into intimate contact with the leaders in practically every industry in which the utilization of electrical energy and current-consuming devices forms an important element in the fabrication of material, Mr. Gray finds a practically developed demand for a big volume of electrical apparatus. Electrical supply jobbers in every part of the country were already beginning to feel the result of this demand and up until the first of August every condition argued well for a most prosperous season. The upsetting of every calculation and good intention with the breaking out of hostilities in Europe will check this demand for some considerable time until readjustment is made. It is very likely, however, and every indication points to the soundness of the reasoning, that our manufacturing institutions are undergoing a rapid readjustment to meet the demands which will come about in this country due to our inability to import many necessities and due to the demands from abroad for a great many necessities that cannot now be produced in their former markets. Manufacturers in other industries generally are up to their capacity in their work-shops based upon a normal present demand. Any unusual volume of business means a desperate attempt to increase efficiency of production, and here the use of current-consuming devices, including electric lamps and motors particularly, will find ready acceptance. During the greatest period of prosperity in our last commercial boom manufacturers enlarged their plants without regard to the utilization of electrical energy and current-consuming devices. Today practically every manufacturer in every industry is absolutely sold on electric light and current-consuming devices, and in every extension, rehabilitation or new development that is contemplated at the present time the use of electricity forms a fundamental part of the equipment. It behooves every Jovian, therefore, to look carefully to his resources. There is a quiet little scare on and a good many good men are out of jobs. If a man has a good position it is advisable that he take good care of it. This is no time for anyone to get "fresh." And, if the electrical salesman has considered that he has had a pretty good working knowledge of the apparatus he is handling it is a good time now to look into every possible opportunity where his material may effect an adaptation which will mean greater economy in production, for it is along this line that profits to the manufacturer in other industries lie. In addition to the practically developed demand for an enormous quantity of electrical material there are still thousands of applications of current-consuming devices that are only being conjectured at this time. If the manufacturer of electrical material and the salesman will exercise only a small portion of the imagination that is now at work conjuring up visions of foreign trade opportunities, and exercise only a small portion of the grim determination and courage that is about to be let loose with regard to this foreign trade invasion and utilize some of this energy in stimulating the undeveloped demand for material right here in these United States, he will find that there is a trade conquest to be made and a market available that are far beyond the possibilities of all the foreign markets of the world.

Wireless Telephony to Be Used on Union Pacific Railway.

F. H. Millener, experimental engineer of the Union Pacific Railway, who for nine years has been conducting experiments for the railway at Omaha, Neb., in composite wireless and wire telephony, announced recently that he had developed his apparatus so that it was now commercially practicable in all respects, and that a complete system of communication was ready to be installed on Union Pacific trains.

Dr. Millener's plans contemplate the establishment of wireless stations at Grand Island and North Platte, Neb., Cheyenne and Green River, Wyo., and Ogden, Utah. Atmospheric, static and magnetic conditions have been studied in that territory for nine years. At Green River a tower 200 feet tall will be placed on the high butte just back of the station, and with a five-kilowatt generator at Cheyenne and a ten-kilowatt generator at Green River, the difficulties of the Rockies will be overcome.

"With our apparatus, which is protected by 19 patents, we can talk to a moving train 100 miles away from a station," said Dr. Millener. "We can call to a moving train and hit it every time; we can talk back from the train; we can talk from car to car—this by wire, of course—and when a train is in a station we can talk to and from it by long distance; moreover, when the train moves out, we can keep up the long-distance conversation with it.

"The Union Pacific anticipates tremendous transcontinental travel next year, and the installation of the composite apparatus insures safety in travel. Trains will be under control of the dispatcher at all times, instead of merely when they are receiving orders at a station.

"By careful investigation and experimentation we have avoided the mistakes which might be made in trying to put an ordinary ship apparatus on a train. Our

apparatus has been carefully worked out in every detail. The antenna consists of two wires running the full length of each car, with connections with other cars at the ends. Our system is made workable by the fact that we do not have to depend upon storage batteries for our electricity, for the illumination of trains on the Union Pacific is supplied by a generator in the baggage car.

"Some advantages the installation will give are that we shall be able to reach the whole right of way at any time, whether the wires are down or not; we shall be able to talk to a passenger train at any time, whether it is in motion or not; we shall do away with the 'bread line' on trains; and I may tell you that people who travel on transcontinental trains will appreciate the advantage of simply ordering reservations in the dining car from their own cars instead of having to travel the whole length of a train two or three times before they can get seats. Besides, the cost of equipping a train will be merely nominal. In case of a bad washout a repair outfit can be quickly equipped with a small set of apparatus and run from either side of the washout and keep in communication with stations, thus avoiding the necessity of putting up a special wire, which is necessary at present."

Illumination for Night Football Practice.

In order that amateur football teams without grounds of their own and composed of boys and young men who are employed during the day and are hence unable to practice save at night, may be able to use the public playgrounds for that purpose, the Park Board of Cincinnati, O., is preparing to install six large arc lights on the Hunt Street playgrounds, which are several blocks in length, to afford sufficient light for night football practice. The lights will be so distributed, with reference to existing street lights, as to give ample illumination over the long stretch of ground in order to enable a number of teams to go through their plays at night without fear of losing the ball. At Inwood Park, another large playground suitable for football practice, there are already sufficient lights for night practice, which will be permitted by the Park Board.

Electric Lighting at Rutland Fair.

More than 5,000 incandescent electric lamps were used in lighting the streets of Rutland, Vt., on the occasion of the Rutland Fair held last week. The fair grounds were lighted by six large arc lamps and the aquarium by strip lamps installed within the glass water tanks containing the exhibition of fishes.

Pole-Raising Contest.

The accompanying illustration shows a pole-raising contest under way. This contest took place at the recent picnic of the employees of the Minneapolis General Electric Company, which was held at Spring Lake Park, Lake Minnetonka, on August 22. There were about 1,000 persons in attendance.

Pole-Raising Contest at Spring Lake Park.

The poles were 25 feet high, and the holes were dug four feet deep. The time taken by the successful team to dig the hole and place the pole was five minutes and 11 seconds; to place the cross-arm one minute and six seconds, and to remove the cross-arm, one minute.

Some Exhibits at the New York Show.

How widespread and important is the use of electricity in modern warfare, as it is now being waged in Europe, is not generally understood. From sparking the motor of the swifty flying air ship, or the heavily loaded motor truck of the commissary department, to revolving the turrets and controlling the fire of great battleships, or setting off the mines which destroy these monsters of the sea, it enters into a wide variety of uses.

For the purpose of showing how important a part electricity plays in modern warfare, the Army and Navy of the United States is arranging a series of special exhibits to be included in the Electrical Exposition and Motor Show to be held in New York City, the second week in October. No effort is being spared to make these exhibits as interesting and educational as possible.

One of these exhibits will show the use of electricity in coast-defense service. It will embrace the mining of harbors, handling of big guns, signal devices and lines of communication, the use of searchlights, etc., in all of which electricity plays a more or less important part. One of the Navy exhibits will be the bridge of a battleship, complete in every detail, and showing how electricity is used to control the great fighting ships of this nation, and, incidentally, how those of other nations now at war are handled when they go into action. How electricity is employed in submarines and the new electric cooking range for warships, also to be shown in action, are other features of the Navy exhibit.

A small arsenal, fully equipped and engaged in making ammunition, is to be exhibited by the Ordinance Department of the United States Army. The chief of this department, Gen. William Crozier, is taking personal charge of the preparation and display of this exhibit. The electrically operated machinery and the officers and men who will use it in making ammunition at the Electrical Exposition and Motor Show, will come from the Frankford Arsenal at Philadelphia.

However, most of the 150 exhibits already arranged are devoted to a more peaceful use of electricity, to its constructive rather than its destructive employment. The Government also participates in this phase of the exposition, for a United States mint, actually in operation making real money, is to be shown. An electrical dairy, where cows are milked, and butter and cheese made through the use of electricity, the electric stimulation of plant and flower growth, and electric automobiles in operation on a ten-lap track, are among the many other interesting features already arranged.

Toledo Fares Enjoined.

The Toledo Railways & Light Company has secured an injunction in the federal court restraining the city of Toledo, O., from enforcing the ordinance which became effective on March 27, providing for a three-cent street-car fare.

For the present, six tickets will be issued for 25 cents, and the three-cent rate will be in force from 5:30 to 7:30 a. m., and from 4:30 to 6:30 p. m.

The Toledo railway situation has been holding the attention of public-utility men for several years.

Pennsylvania Electric Association.

Seventh Annual Convention, Eagles Mere, Pa., September 8-11.

For the third time in its history, the annual convention of the Pennsylvania Electric Association was held at the Forest Inn, Eagles Mere Park, Pa. This was the seventh annual convention of the Association, although its third since becoming a State Branch of the National Electric Light Association. The gratifying growth of membership which the Association enjoyed during the year was reflected in the attendance at the convention, which surpassed that of any other meeting.

As this convention marked the anniversary of practically the first year of public-service commission regulation in Pennsylvania, it was natural that most of the discussion related to this phase of the utility business. As an indication of the harmonious relations which exist between the utilities of the state and the Commission, the secretary, chief engineer, rate expert and other officials of the Commission were in constant attendance at the sessions.

The convention was formally opened on Tuesday evening by a reception tendered to President and Mrs. Campbell, following which there was dancing and musical entertainment. The first business session was held on Wednesday morning with President Campbell in the chair.

In his presidential address, Duncan T. Campbell called attention to the work accomplished by the Public Service Commission and the fairness of its decisions. He suggested that a permanent committee be appointed to confer with the Commission in all matters relating to public utilities.

Referring to European conditions, Mr. Campbell said that the war undoubtedly affects manufacturers of this country to a greater or less extent. This, of course, has a bearing on revenues of the electric utilities but it also furnishes an opportunity for central-station companies to demonstrate the economies of electric operation.

In conclusion, he predicted greater prosperity in the near future, particularly in the State of Pennsylvania. He urged greater co-operation between utilities of the State and the Commission and between each other.

Vice-President Long, who occupied the chair during the address of Mr. Campbell, appointed a committee comprising E. H. Davis, A. R. Granger and Thomas Sproule to consider the president's address.

The report of the Executive Committee was then presented by Walter E. Long, this being a record of the three meetings held during the past year. Stephen C. Pohe then presented his report as secretary-treasurer, indicating the financial affairs of the Association to be in a prosperous condition.

The Membership Committee, of which W. E. Long was chairman, reported a total membership as of September 1, 1914, of 1,600, divided as follows: 80 Class A; 1,407 Class B; 28 Class D; 84 Class E; and one honorary member. This compares with 1,367 members for last year, a gain of 367.

The report of the Accounting Committee was then presented by H. R. Kern, chairman. The system presented by the Committee was prepared after conferences with the Public Service Commission and along the same general lines as the system presented by the National Electric Light Association. The Committee states that it considered it preferable that a single classification be arranged which would apply to both large and small companies and this has been accomplished by reducing the number of controlling or indicant accounts as much as possible, which in turn should include a number of subdivisions.

The system includes 13 main classifications which are in turn divided into 401 individual accounts. The first general classification is of plant and investment accounts. This includes 24 individual items with numerous subdivisions of these. The second general heading covers income accounts with 12 separate classifications. The other accounts include operating expenses—generation; operating expenses—transmission; current assets; other assets; preferred charges; capital liabilities; current liabilities; accrued liabilities; permanent and corporate reserves; operating reserves; and surplus accounts.

A brief discussion relating to some of the details of the proposed system was held. E. H. Davis, of Williamsport, criticised the account dealing with unexpected or large expenditures which the Committee suggested should be charged pro rata monthly with an amount that will effect a uniform distribution of the expense within the next ensuing twelvemonth or shorter period. He held that this was too short a period in which to charge off the expense of rebuilding a plant or line destroyed by fire, storm, etc., which was clearly an extraordinary expense. Mr. Kern explained that this classification does not cover replacements or renewals which are provided for under separate accounts. He thought that the account was somewhat misleading, however.

Geo. B. Tripp, of New York, thought that the classification, commercial lighting service, should be subdivided into various accounts which cover the different lighting service furnished by a company, such as residence lighting, commercial lighting, sign lighting, etc. The same subdivisions should be made of the general account dealing with commercial power service. Referring to the previous discussion on the item of extraordinary expense, Mr. Tripp thought it advisable to leave out any reference to the number of months in which the expense should be charged off.

E. H. Davis objected to items such as amortized discount on debt, sinking fund accruals, amortized premium on debt, being deducted from the gross income, as he thought it more advisable to charge these to operating expense. Mr. Kern explained that these items are in the same class as taxes and because they are deducted from the gross income does not prevent them from being charged to operating expense.

L. E. Joyce, of the Public Service Commission, stated that the aim of the Commission as regards accounting, is primarily to attain a uniform system that will permit of comparisons being made. He stated that no attempt will be made by the Commission to dictate how books should be kept and companies need have no apprehension in this matter.

The report of the Safety and Welfare Committee was then presented by Henry Harris, chairman. This Committee reports that the encouragement of employees to continue in the service and to fit themselves for advancement in position has been one of the results of welfare work as undertaken by the Pennsylvania companies, and the cordial relations existing are manifested in the efforts of the employees to fully serve the public.

In response to a poll conducted by the Committee, it was learned that fully 25 per cent of the companies of Pennsylvania are following well considered plans of welfare work.

The report comments at some length on the safety of employees by the prevention of accidents and disease with particular reference to the work of the National Electric Light Associa-

tion in this respect and also to the work of the State Department of Labor and Industry. It is pointed out that a workman's compensation law is inevitable and the utilities should anticipate this by a compensation system of their own. The Committee has made a thorough investigation of various compensation plans now in effect and submits in the report accurate estimates on the cost of compensation for disablement as follows. A liberal compensation plan providing for payment of full wages, three-quarter wages, one-half wages, and one-quarter wages, for succeeding periods of 13 weeks, for each of the first three amounts and for a maximum period of 261 weeks at one-quarter wages, for accidents incurred while performing company duties; and similar payments for lesser periods for accidents incurred while not performing company duties, as well as for sickness from any cause, can be maintained for 2.75 per cent of the pay roll and may be administered by the company itself or underwritten by a liability insurance company. Insurance on the lives of employees in the amounts of their annual wage or salary can be provided at slightly over 1 per cent of the total annual pay roll.

Service annuities are recommended as important in welfare work. Annuities based upon the payment of 1 or 2 per cent for each year's service of the average wage for a given period can be maintained for 1 or 2 per cent of the annual pay roll.

Other features of welfare work which the Committee suggests should be given the deepest consideration are the provision within the company for saving and investment funds and vocational education. The latter in a large measure implies a co-operation of school authorities, of employers and of employee, for in this way only is it possible for that large number of young men whom necessity compels to work before their education is complete, to fit themselves for advancement.

W. H. Johnson, of Philadelphia, opened the discussion, calling attention to the workmen's compensation act presented to the legislature in 1913. This bill permitted an employee to derive the benefits of such compensation as the company in its own work provided and in addition to collect the amounts specified under law. Mr. Johnson held that this was unfair to the companies and that the Association should take steps to see that a more equitable provision was incorporated in a new law which will be proposed in the near future.

B. F. Day, of Philadelphia, spoke of the lack of interest which the small companies take in the welfare work because of their belief that the expense involved is prohibitive. He emphasised the fact that any welfare work which can be carried on by one large company can be equally well carried on by a number of small companies jointly with maximum results and a minimum expenditure.

G. E. Wendell, of Williamsport, spoke of the vocational education work which is being agitated in a number of localities. The plan provides for the co-operation of all manufacturers in the city in the establishment of such a school, the students being composed of employees who are allowed a definite number of hours a week to attend, on the employers' time. About three-fourths of the necessary money is provided by the State educational department in all cases where it is proposed to establish such schools.

Henry Harris, of Wilmerding, called attention to similar activities of the large department stores of Pittsburgh. He emphasized the fact that an expenditure of two or three per cent of the total pay roll will return to the manufacturer five per cent on the investment. This, however, represents only a small part of the returns that are traceable to the increased efficiency of the employee.

H. N. Müller, of Pittsburgh, stated that his conception of the entire subject of welfare work was simply to provide within the company as much as possible those things which the employee had previously gone outside to obtain.

Thursday Morning Session.

A paper entitled "Interurban Lighting," by R. W. Hoy, of Harrisburg, was the first paper of the session on Thursday morning. This paper points out that interurban lighting has been a much discussed subject since the successful application of the new high-efficiency incandescent lamp. Mr. Hoy suggests that definite steps should be taken at once to decide upon standard equipment for this service. The idea of standardizing the equipment is for the purpose of selecting a lamp and reflector, as well as the height the lamp should be placed above the roadway, so that every road in the State would as near as possible be uniformly lighted.

It is pointed out that in almost every section desirable prospective business is available that can be secured if properly solicited. With a contract with a city or a county for lighting a certain number of miles covering a period of years, where the revenue from this lighting would be guaranteed, an additional circuit could be run along at very little cost and considerable business could be secured along any one of these lines.

Referring to conditions in the Harrisburg territory, Mr. Hoy described the activities of the Harrisburg company in constructing a line to the borough of Dauphin, a distance of nine miles. In attempting to secure the passage of an ordinance providing for such a lighting system as the company proposed, it was learned that the revenue that was derived from taxation from which all public improvements were to be paid was not enough for the payment of sufficient number of lamps to light the borough properly. Upon investigation it was found that a State law permitted every municipality to obtain sufficient revenue from taxes to properly light the streets, and the taxes of the borough were promptly raised to meet the extra expense involved.

In the Dauphin installation, 100-candlepower 6.6-ampere gas-filled lamps are used, equipped with reflector and prismatic refractor. The contract with the borough covers a period of five years and provides for the installation of 15 of these lamps. The lamps are attached to a mast arm extending from the pole about ten feet and can be raised and lowered by means of a chain and swivel joint. They are placed at a height on the pole so that the lamp is about 18 feet from the ground.

A 2,300-volt single-phase distribution line was constructed which cost on the average $933.62 per mile.

Herbert Snow, chief engineer of the Pennsylvania Public Service Commission, opened the discussion, calling attention to a profitable field for the installation of additional lighting equipment. He thought the new high-efficiency lamps installed at grade crossings would do much towards eliminating the danger which now exists at the many unprotected crossings.

E. B. Greene, of Altoona, spoke of the interurban lighting in the Altoona district. There are several 2,300-volt transmission lines averaging in length from 1.5 to 5 miles, radiating from the power station. Lamps are spaced 300 feet apart. As these installations were made before the introduction of the new lamps, 60 and 100-watt Mazda lamps are used. Mr. Greene also called attention to the obstacles which are frequently wilfully placed in the way of securing right-of-way for pole lines. He thought that in view of the fact that a transmission line enhances the value of the property which it covers, the co-operation of property owners and others should be extended.

H. H. Ganzer spoke of lighting installations in three small boroughs aggregating a total of 225 40-watt incandescent lamps. Standard equipment is

used throughout. The total mileage of these lines is 13 and about 325 meter customers are also served.

E. D. Dreyfus, of Pittsburgh, called attention to the itemized figures presented by Mr. Hoy as to transmission-line costs in Harrisburg. He thought that the figures presented are somewhat misleading in as much as they do not take into consideration interest on the investment, taxes, depreciation and other intangibles.

In closing the discussion, Mr. Hoy mentioned that there were 40 residence consumers along the 10-mile line referred to in the paper.

A paper entitled, "Requirements of the Public Service Commission, Covering Meter Testing and Voltage Regulation," was then presented by E. H. Tyson, of Allentown. This paper interprets the rules of the Commission along the lines of the best practice of today with particular reference to companies having less than 10,000 meters on their lines. Potential and current transformers, shunts and multipliers, known as accessories, are required by the Commission to be tested at least once in each five years. It is recommended that central stations buying meter accessories and not having facilities to test them may fulfill the Commission's requirements covering the first five years of their use, by securing from the manufacturer individual certificates of accuracy with each transformer or shunt.

Regarding meter records it is suggested that three files are necessary showing, first, meter location; second, tests and inspections; and third, date tests are due. The first two files should consist of one card for each meter filed either according to the company's serial number or according to make, type, amperage, voltage, wire, etc., with each class in the rotation of the manufacturer's serial number.

It is pointed that great care must be used in determining the time allowed to elapse between periodic tests. If tests are made oftener than necessary the cost of maintenance is correspondingly higher than it should be, and if not often enough, there is a possibility of loss in revenue.

Data are given on the use of primary working standards and also on the equipment and operation of the meter room.

A paper by Prof. L. H. Harris, consulting engineer for the Public Service Commission of Pennsylvania, dealing with definitions of some of the Commission's rules relating to electric utilities, was read by A. H. S. Cantlin, of Allentown. This paper took up the question of voltage variation and rules of the Commission governing (1) record of station voltage; (2) complaint records; (3) maintenance and inspection; (4) defective apparatus; (5) reports and records; (6) allowable error of meters; (7) meter records; (8) facilities for testing meters; (9) frequency of tests; (10) power-factor adjustments; and (11) place of making tests. The underlying policies gathered from the definitions of these rules are that each meter should be tested before installation, should be correct on low power-factor, and should be tested periodically and on the customer's premises. Small meters should be tested once in every three years and larger meters at more frequent intervals. In all cases the Commission must certify as to the accuracy of the rotating standard used.

Herbert Snow, of the Pennsylvania Commission, who was called upon to open the discussion, urged that the fullest co-operation should exist between the utilities and the Commission. He recommended that an engineering committee of the Association be appointed to confer with the Commission in all matters pertaining to the engineering side of the Commission's work.

At this point George B. Muldaur of the Society for Electrical Development delivered a brief address, calling attention to some of the work which has been accomplished since June. The functions of the different branches of the Society were outlined and reference made to some of the commendable activities in each department.

A brief address was then delivered by Mr. Sewall, assistant to the secretary of the National Electric Light Association. Mr. Sewall referred particularly to the benefits which Class B members received and to the action of the Association at Philadelphia reducing the cost of membership for this class. He urged that a comprehensive campaign be inaugurated in Pennsylvania for more members.

Discussion of the Question Box was then started, the first question propounded being, "How low can four-ampere luminous arc lamps be safely hung where there are shade trees?" In reply to this F. M. Noecker, of Renovo, stated that his practice is to hang these lamps 17 feet from the ground. In the localities so lighted the trees are trimmed from the bottom up.

The second question presented was: "Is it advisable to throw off the switch during severe electrical storms in a residence where the service lines run directly from the pole to the side of the house; also in case such service lines should be struck by lightning, when the switch is thrown off, is the danger lessened, or is it safer to leave switch in, providing proper grounds are installed?" In reply to this, P. H. Bartlett, of Philadelphia, stated that in his opinion it was perfectly safe to leave the switch closed.

The third question considered was: "Is it generally admitted that a meter reader should not discuss with a customer, when reading a meter, the amount of current used and consequent amount of bill? What is the best way of avoiding this, when asked, so as not to antagonize the customer?" E. H. Tyson, of Allentown, thought that while the meter reader should not talk in terms of money, it was advisable, he thought, to give the customer data on his kilowatt-hour consumption when this information was asked for.

E. B. Greene, of Altoona, explained that slips are given the meter readers in Altoona on which appears only the number of the meter and its location. It is thus impossible to inform the customer as to his consumption unless the previous month's reading is obtained from the office by the customer.

W. H. Johnson, of Philadelphia, stated that meter readers were instructed not to discuss bills or consumption with customers, but each reader is supplied with a quantity of dials which explain how meters should be read and these are given to customers when inquiry is made.

L. B. Schneider, of Allentown, explained that extreme tact is necessary on the part of the meter reader, especially if the company's rules prevent him from giving the figures to the customer. The Allentown company requires meter readers to inform customers that the figures on the consumption and the amount of the bill will be cheerfully given upon application to the office.

Thursday Afternoon Session.

A short session was held on Thursday afternoon which was devoted primarily to an address by Frederic W. Fleitz, a noted Pennsylvania attorney, and talks by members of the Pennsylvania Public Service Commission. Previous to this E. H. Davis, of Williamsport, presented the report of the Committee on Public Utilities Interconstruction. This report dealt mainly with progress made during the past year.

General Fleitz devoted considerable time to a discussion of the personnel of the Pennsylvania Commission, paying special tribute to the integrity and ability of the Commissioners and those employees who deal mainly with electric utilities. He said that the Pennsylvania law is more drastic than any utility law of any other state because of its completeness and thoroughness. The Commission in the decisions so far made has shown its attitude to be one of fairness and justice.

General Fleitz urged that utilities of the state co-operate with the Commission to the fullest extent and to be frank with it in all matters. He spoke of the function of the Commission to arbitrate the differences that may arise between the public and the utilities, but the ideal condition was to conduct the business so that appeal to the Commission would be unnecessary, either on the part of the public or the company. The speaker emphasized the importance of gaining public approval, stating that this was worth more than all other assets of the company combined.

G. P. Wilson, in charge of rate matters for the Commission, and A. B. Millar, secretary, spoke briefly, explaining the desire of the Commission to co-operate with the utilities in every possible way.

Friday Morning Session.

The session on Friday morning was opened with the presentation of a paper entitled, "Securing the Small-Residence Business," by E. W. Osborn, of Scranton. This paper appears elsewhere in this issue.

Before taking up discussion of this paper, H. F. Hatch presented his paper entitled, "Flat-Rate Meters for Heating and Lighting Loads." This paper outlines the experience of the Wilmington (Del.) company, with flat-rate meters. In the beginning it was estimated that over 1,200 customers could be obtained by offering a flat rate and equipping the installation with an excess indicator. Solicitation was started and a large number of small customers obtained. Later, because of some trouble experienced with the indicator and also because a change in management took place, the flat-rate system was discontinued.

An analysis of conditions indicated that the consumption of energy per customer increased when the flat-rate indicator was substituted for a meter, this increase averaging 15 per cent annually per customer. It has also been the experience of the Wilmington company that complaints from small residence customers have decreased considerably since the elimination of the flat-rate system. It is stated in the paper that although the company has discontinued the sale of current on a limited flat-rate basis, it is not in any way trying to discredit the flat-rate business. It is suggested that the use of the excess intergrating watt-hour meter and the flat rate plus the excess system will be a big help to the central stations who are now selling or contemplate selling current on a flat-rate basis. The instrument used is a standard watt-hour meter with an external attachment. The paper presents details of the instruments and the operation of the system, which is reported as successful in Wilmington.

Discussing the limited flat-rate business in Wilmington from the viewpoint of the meter department, the author points out that a characteristic common to all of these devices is that if the load is increased beyond the point at which the instrument is set and operates, the customer's voltage will be a resultant of the full potential and the zero-potential, and will vary with the frequency of the interruption. The instruments used by the company were found to need frequent adjustment and repairing, three months being the maximum limit for inspections. Last year 490 of these instruments were tested, and 359 were found to be operating within 10 per cent of the contract limit; 118 required adjustment and 13 replacing. Further investigation brought out the fact that it was impossible to charge storage batteries from the circuit, to iron, to operate fan motors, small power motors, and to do numerous other things, which if done by the consumer would yield no revenue to the company.

Those taking part in the discussion included A. W. Burke, of Wilmington, Del.; E. B. Greene, of Altoona; A. T. Holbrook, of Pittsburgh; H. H. Gauser, of Norristown; R. W. Hoy, of Harrisburg; E. W. Osborn, of Scranton; J. W. McKelvie, of Pittsburgh; F. M. Noecker, of Renovo; P. H. Bartlett, of Philadelphia; M. K. Watkins, of Mount Carmel, and W. L. Loeb, of Pittsburgh. Mr. Burke inquired whether the Scranton company attempted to sell electric irons to customers using the flat-rate system. Mr. Osborn explained that these customers were largely foreigners who would not appreciate the advantages of electric ironing.

Mr. Greene, commenting on Mr. Osborn's paper, said that his experience in Altoona was similar to that of the author's. Foreigners took kindly to the flat-rate system, except the Italian, who preferred the meter. His company carries on a flat-rate campaign every fall. Mr. Greene spoke of the increased load on Tuesday, due to ironing, this averaging 1,400 kilowatts over the usual load.

Mr. Holbrook, discussing the paper by Mr. Hatch, defended the product of his company against the attack made in the paper. He cited the former conditions existing in Wilmington, when competition was severe, and how, when the properties were consolidated later, the excess indicator was introduced. Much of the trouble experienced with these devices was due to the chaotic conditions which existed just prior to the consolidation. Mr. Holbrook contended that the results obtained were remarkable, in view of these conditions. As a justification for the use of the excess indicator, Mr. Holbrook called attention to the noteworthy investigation made by S. E. Doane, and the report presented at the National Electric Light Association convention at Philadelphia. Mr. Holbrook stated that there are more companies using the flat-rate system in Pennsylvania than in any other state in the Union. He said the disuse of flat-rate controllers in Wilmington was due to the attitude of the company, and also to the removal of a minimum bill.

Mr. Hoy said that in Harrisburg his company was able to secure certain business by means of the excess indicator, which it would have been impossible to secure by any other means. The Harrisburg company now has 800 instruments, although from 1,500 to 1,800 have been installed, the difference representing those that have been subsequently changed over to meters. In no case has a meter customer expressed the desire to have flat-rate service.

Mr. Osborn explained conditions in Scranton, this company being one of the pioneers in the use of flat-rate indicators. There are now some 3,500 instruments in service in this territory. The average income per month from the flat-rate customers is $1.25, which is about the same as the meter customer. The company has found the instruments to be fairly accurate, and to give satisfaction. In one town served by the company, having a population of 6,000, there are 1,200 customers, chiefly because of the excess indicator. The average in all of its territory is one customer to every 10 inhabitants.

Mr. McKelvie gave the experiences of the Duquesne Light Company in Pittsburgh, which has 4,000 indicators in service. The income from these customers averages $70,000 annually, and tests show the rate to range from 2.3 cents to 7 cents per kilowatt-hour.

Mr. Noecker explained that the Renovo company serves 75 per cent of the residences in its territory, and all are on the meter basis. The company offers no premiums, has no residence salesmen, but installs wiring and allows the customer to pay for it on installments.

Mr. Bartlett considered the excess indicators that are at present available entirely too expensive and too bulky. He did not question their usefulness in the smaller communities, but thought that the manufacturers should bring out a much more inexpensive device. To be profitable, the investments in the small residence customers must be low.

Following this discussion, a paper entitled, "Insulator Design in Relation to Lighting and Other Static Disturbances," by A. O. Austin, was presented by J. S. Wise, Jr. This paper compares the large systems with small generator equipment and small conductors, with large systems with large generating capacity and large conductors, etc. The former, he said, are not so prone to the surge evils, caused by switching, arcing, grounds, etc., while the latter require a large insulator to protect them against the surges. He suggested that in the interconnected systems the troubles might be localized by using steel conductors on the interconnecting links. These would offer enough impedance to lessen the disturbances, besides localizing the trouble. Surges on large systems affect the insulators more than lightning and with high-frequency surges the cement in insulators acts as an artificial ground. He claims that routine tests in service are preferable to design tests. There is a growing tendency to discard the oil-puncture test and pay more attention to routine tests, which affect or eliminate all weak members. The better designed insulators provide more strength to resist thermal stresses set up by uneven heating or by cement expansion, which tends to crack the insulators in time.

As there was no discussion, the reports of outstanding committees were called for, and resolutions of thanks offered to all who contributed to the success of the convention.

The election of officers resulted as follows:

President—Walter E. Long, of Philadelphia.

Vice-president—S. C. Pohe, of Bloomsburg.

Secretary-treasurer—H. M. Müller, of Pittsburgh.

The Executive Committee, elected for a term of two years, is composed of W. R. Kenney, of Connellsville; Henry Harris, of Wilmerding; J. S. Wise, Jr., of Hazelton, and F. M. Noecker, of Renovo, elected for one year.

Entertainments.

Elaborate entertainment was provided, which, in addition to the reception and dance on Tuesday evening, included vaudeville on Wednesday evening, dancing Thursday evening and a musicale on Friday. Various golf and tennis matches were held during the days, and on Friday afternoon a ball game was played between representatives of the manufacturers and central stations.

On Wednesday evening, following the vaudeville entertainment, a rejuvenation of the Jovian Order was held under the direction of J. C. Vogel.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Pacific Coast Convention, Spokane, Wash., September 9-13.

The American Institute of Electrical Engineers held its 298th meeting at the Davenport Hotel, Spokane, Wash., September 9 to 13. The convention was held in conjunction with that of the Northwest Electric Light and Power Association, one of the sessions being a joint session. The registration list of the American Institute showed over 200 names and that of the Northwest Electric Light and Power Association, 135.

A joint banquet was held on Friday evening in the Marie Antoinette ballroom of the Davenport Hotel, with about 175 in attendance. O. B. Coldwell, president-elect of the Northwest Association, presided and acted as toastmaster.

The first session, which was held on Wednesday morning, September 9, was called to order by N. L. Bleecker, in the absence of D. L. Huntington, the chairman of the convention committee. Mr. Bleecker introduced W. J. Hendley, the mayor of Spokane, who made an address of welcome. N. W. Brockett, secretary of the Northwest Electric Light and Power Association, made a response thanking Mayor Hendley for his address and cordial welcome.

J. B. Fisken then introduced P. M. Lincoln, president of the American Institute of Electrical Engineers. J. W. Hungate, chairman of the Spokane Section, presented Mr. Lincoln with a silver-mounted gavel, the handle of which was made from a pole and the head from a cross-arm that have been in service in Spokane for 25 years. Mr. Lincoln made a suitable response and then called upon Leslie F. Curtis to read a paper entitled "The Effect of Delta and Star Connections Upon Transformer Wave Forms." This was accompanied by lantern slides.

The Effect of Delta and Star Connections Upon Transformer Wave Forms.

The purpose of the paper is to show the distortions resulting from different symmetrical three-phase connections of generator and transformers without transmission line, as dependent upon the hysteresis cycle and the admittance of the transformers at no-load. Tests were made with the oscillograph to show the no-load exciting current and voltage waves of three single-phase step-up transformers when the windings of the generator and both sides of the transformers were connected in all possible symmetrical delta and star relations. Tests are divided into four groups, according to the connection of the generator. In all cases normal low-tension line voltage was held, but voltage and current measurements were considered less important than the recording of wave forms. Oscillograms are given in each case and the relations between the flux, voltage, exciting current, and the hysteresis cycle are shown in two instances. The author points out that the best voltage wave forms will, in general, be obtained with a star-connected generator and delta-star or star-delta-connected transformers.

H. V. Carpenter opened the discussion by referring to the effect of the third harmonic upon the magnetizing current of a transformer, which was very clearly shown in the oscillograms.

A. A. Miller commented upon the ease and accuracy which such conditions are diagnosed by means of the oscillograph.

M. H. Gerry, Jr., said the question was still open as to whether delta or star connections were to be preferred. Perhaps the use of the oscillograph will permit a decision to be reached soon, but there is little choice between them. It is because neither has any very decided advantage that the question remains unsettled.

Mr. Ferris illustrated a method of connecting an air-core inductance coil in series with the line with a condenser in shunt with it, and in series with the vibrator of the oscillograph for investigations of this kind. Resonance must be avoided in this connection.

L. J. Corbett and L. T. Merwin also spoke.

The afternoon session was a joint session with the Northwest Association, and James E. Davidson of Portland, Ore., occupied the chair and introduced W. W. Cotton, of the Portland bar, who made an address upon the subject, "Rates and Physical Valuation of Public Utilities." This was a clear exposition of some of the most vital points affecting the life and property of public-utility companies.

F. D. Nims was then called to the chair, while a paper on "Outdoor Substations" was presented by J. C. Martin.

Outdoor Substations.

Mr. Martin's paper shows that in order to supply power to irrigation, farming and other scattered and relatively small customers in the neighborhood of high-tension lines, the cheapest possible type of equipment consistent with reasonably reliable service must be provided for serving them. This has called the outdoor type of substation into being. The paper discusses the detailed requirements of this type of substation, chiefly of installations as small as 25 kilovolt-amperes and ranging in voltage up to 66,000 volts. The transformers must be of the oil-insulated and self-cooled weatherproof type; these are found to be very reliable, but in special cases may have to be guarded against freezing of the oil and the internal condensation of moisture. High-tension automatic oil switches are too costly for this purpose and therefore outdoor-type air-break switches are used on

the high-tension side of transformers, but only as disconnecting switches, since the low-tension oil switches are used to open the circuit on load. Pole-top switches must be carefully selected, however. The installation of lightning arresters depends on the contiguity of other substations, etc. The low-tension control panel should usually have an automatic oil switch, ammeter, voltmeter, and possibly indicating and integrating wattmeters, if the installation is for a group of customers. Steel supporting structures are seldom used for these small outdoor substations on account of cost. Wood-pole structures, employing from two to six poles, usually suffice. The low-tension control equipment should be inclosed in a steel housing, if possible. A number of outdoor substations in the state of Washington were described in the latter part of the paper.

V. H. Greisser opened the discussion by describing the practice of the Washington Water Power Company in the design and operation of outdoor substations.

P. M. Lincoln spoke of two inherent weaknesses of the air switch and fuses in high-tension lines: (1) the likelihood of not being able to open successfully a circuit carrying much power, and (2) the fact that surges may be introduced which have bad effects elsewhere in the system.

Evidence that the air-break switch with fuses is without apparent ill effects when used on circuits with relatively small power was given by J. Harisberger, J. B. Fisken, O. B. Coldwell, M. H. Gerry, F. D. Nims and L. T. Merwin.

In closing the discussion, Mr. Martin stated that for three-phase transformer substations he did not approve of the use of low-tension fuses where high-tension fuses are in use, but would prefer a low-tension oil circuit-breaker. For high-tension fuses he favored the Schweitzer and Conrad type. He had found it satisfactory to have high-tension transformers shipped with oil in the tanks.

J. Harisberger occupied the chair while W. E. Herring presented a paper entitled "Electric Power Developments on the Pacific Coast."

Electric Power Development on the Pacific Coast.

Mr. Herring's paper gives a summary of the power situation, particularly in regard to hydroelectric development. Government reports indicate that the three states of Washington, Oregon and California possess 11,504,000 horsepower or about 43 per cent of the potentially available water power of the country. Of this total about eight per cent has been developed on the Coast; a considerable part of the potential power may never become commercially available, however. In these three states there are five large and distinct zones of hydroelectric development. Data on the water and steam plants of the principal power companies in these states are given in the paper. The first water-power plant in this district was built at Oregon City in 1889. The power companies in the Pacific Northwest have had to overcome an unfavorable feature in the use of cheap fuel by the largest power users, the lumber mills, which utilize their refuse for this purpose. From 1900 to 1910 the power companies could not meet the power demand through hydroelectric development and consequently put in many steam auxiliary plants. Subsequently saturation of the power market has been approached and the steam plants in the Northwest, where water-storage facilities abound, are almost superfluous. The three largest companies in this district now have an excess capacity of 40,000 to 50,000 horsepower in their combined water and steam plants. The utility corporations are trying to build up the communities they serve. As a rule, the public does not give them credit for this work. In order to attain the highest economy, there has been brought about much consolidation of power systems; the economic necessity for this has not been generally appreciated by legislators and the public in general.

O. B. Coldwell opened the discussion. He stated that by reason of improvement in the load-factor of water-power plants, the importance of water storage was being recognized more than ever before. He supported the points brought out in Mr. Herring's paper.

C. S. McCalla commented upon the present overdevelopment of water power in the Pacific Northwest.

J. C. Ralston complimented the author and emphasized the necessity of more liberal treatment of invested capital by commissions and legislators. He made a plea for an adequate return upon capital and deprecated the destructive legislation which is now being advocated by those who are profoundly ignorant on the subject. It is the duty of engineers to educate legislators to a better understanding of the fundamental facts.

In closing the discussion Mr. Herring emphasized the points brought up by Mr. Ralston.

On Thursday morning there were separate sessions of the two societies. The meeting of the American Institute was called to order by President Lincoln. The first paper presented was by Edward Woodbury, and was entitled "Some Operating Conditions of the 150,000-Volt Transmission System of the Big Creek Development of the Pacific Light & Power Corporation."

150,000-Volt Transmission System.

The paper describes operating conditions on the 150,000-volt transmission line of the Pacific Light and Power Corporation which delivers power from the Big Creek hydroelectric development to Los Angeles, Cal., 240 miles away. In daily operation 60,000 kilowatts are generated, utilizing a total hydraulic head of 4,000 feet in two steps. Plans for the future contemplate the building of two more power houses, operating under somewhat lower heads. Of particular interest is the complete success of the constant-potential system, i. e., operation at the same voltage at the generating and receiving stations, by means of synchronous condensers at the receiving end, in conjunction with automatic voltage regulators, one for each condenser as well as for the generators at each of the power houses. The line has been operated with unusual freedom from short-circuits. Appendixes describe the development of the system, and give data relating to the equipment of the Big Creek transmission line.

The discussion was opened by J. Harisberger, who inquired as to whether synchronous condensers are necessary to successful operation.

J. B. Fisken congratulated Mr. Woodbury on the record of service as shown by few interruptions.

W. H. R. Fraser said that the British Columbia Electric Railway Company has found that a turbine-driven generator can be used as a synchronous condenser by disconnecting the turbine from the generator and running the latter on the line.

M. H. Gerry, Jr., remarked on the wonderful strides made in the last 18 years in transmission-line voltages and told of some of his early experiences in transmission work in Montana.

P. N. Nunn also gave reminiscences of pioneer work in this line.

After questions by A. A. Miller, Mr. Woodbury closed the discussion. The principal reason for using synchronous condensers is that they hold the voltage at the receiving end almost constant regardless of load and power-factor. With steam-turbine units of the vertical type it is not practicable to use them as synchronous condensers. Synchronous condensers are needed most during the daytime and without them the power-house voltage runs to approximately 170,000. Before doing repair work on a 100-mile section of dead line the voltage to ground is measured by an electrostatic voltmeter and is generally found to be about 4,200 volts. The line is then grounded and a similar reading taken at the other end, where it is found to be about 800 volts. This end is also grounded. Linemen are instructed to use additional ground connections at the point where they are working.

J. W. Hungate was then called to the chair, while a paper was presented by F. D. Nims on "A Distribution System for Power Purposes."

A Distribution System for Power Purposes.

The paper describes the distribution system of the Western Canada Power Company, Limited, touching on the overhead and underground systems in general. It describes the advantages

obtained by duplicating lines, both for eliminating outages and from a financial standpoint. Mention is made of the advantages obtained by using a steel-taped lead-armored cable placed directly in the ground, figures showing the exact cost of such an installation being given.

This paper was discussed by J. D. Fisken, P. M. Lincoln, C. S. McCalla, H. V. Carpenter and others. Mr. Lincoln spoke of the importance of the use of armored cable and the trouble in getting rid of the heat from cables laid in ducts. Mr. McCalla told of trouble from electrolysis of the armoring. Professor Carpenter told of locating faults in buried cables by the inductive method, using an exploring coil of many turns connected to a telephone. Mr. Lincoln said that current would often flow in the lead sheath beyond the faulty point, so that a wrong indication would be given by the telephone, and he had abandoned this method in favor of the Murray loop.

In closing the discussion, Mr. Nims said that four cables was the maximum for a single trench and he preferred not more than two. Faults are located within 75 or 80 feet by the use of a megger. The telephone and exploring coil do not give sufficiently accurate results. Under railroad crossings in British Columbia cables are required to be in concrete, so a wooden duct is used at such points. His experience indicated that there was less electrolytic action in a steel-armored lead-covered cable with simply jute between the armor and the lead than in a lead-covered cable alone.

The session on Thursday afternoon was called to order by President Lincoln at two o'clock and R. F. Monges was called upon to preside. E. F. Whitney presented a paper entitled "Electricity in the Lumber Industry."

Electricity in the Lumber Industry.

The development in the application of the electric drive to the lumber industry has been exceptionally rapid. Successful sawmill companies are now even operating entirely from central-station service, notwithstanding the large amounts of refuse available for fuel. The paper considers the lumbering industry as carried on in Washington and Oregon, and describes the application of electric power to the various operations carried on under the two main divisions of logging and milling. Typical applications are described to illustrate types of motors and power-transmsission equipments, and the average power demands of the various logging operations and milling processes. In addition to the machines used in ordinary sawmill work, those used in planing mills and shingle mills are described. The question of the disposition of waste is considered, and comparative fuel values are given. The illustrations show logging operations and electrically driven saws, finishing machinery and lumber-handling machinery in the Pacific Coast lumber districts.

In opening the discussion Mr. Monges emphasized the fact that the lumbering industry is the most important on the Pacific Coast and is a large user of power. As yet but few mills have been electrified but it is safe to say that no large new mill would be built without giving the electric drive very serious consideration.

A. A. Miller spoke in appreciation of the paper and called attention to the change in attitude of the mill owner with respect to electric drive. Eight years ago not one of them could be convinced that electric current was suitable for any other purpose than lighting.

F. D. Weber told of some experiences six or eight years ago in connection with the first electrically driven mill in the Pacific Northwest, which was located at Dee, Ore.

J. B. Fisken complimented the paper and inquired as to the load-factor in the average lumber mill.

L. T. Merwin said that the difficulty with big loads in saw-mill work will be overcome. He asked the author as to whether any steps have been taken to smooth out the demands on power-house equipment by using either flywheel storage of energy or by using the Ilgner system, as in mine-hoisting loads.

Mr. Cheney raised the point as to the practicability of briquetting sawdust for use as fuel.

Mr. Norman said that the load-factor of the mill of the Booth-Kelley Lumber Company is about 50 per cent. He said that as a general proposition a saw-mill load will not be a profitable one for the central station.

W. H. R. Fraser said that a mill in Vancouver was fed over a 11,000-volt line nine miles long and took nearly 1,000 horsepower. Although a town was fed over the same line without voltage regulators, operation has been satisfactory.

J. Harisberger thought that central stations could serve lumber mills from hydroelectric generating stations at a price which would be attractive to the prospect and also profitable to the central station. He cited a case where the load-factor was about 30 per cent.

H. V. Carpenter inquired as to the power-factor of such loads and Mr. Whitney then closed the discussion. He claimed that electric power can be used to advantage in lumber-mill work. Steady voltage at the motor terminals is very necessary in logging work. The logging engines are frequently 1,000 feet from the substation and sufficient copper must be used in the feeders. Armored cable is generally used for this purpose. Squirrel-cage motors are generally used in lumber mills to avoid fire risk. When slip-ring motors are used they should be of the inclosed type. The maximum demand is usually about 70 per cent of the connected load and the average load about 70 per cent of the maximum. In one case the load-factor was 57 per cent, the connected load being 1,550 horsepower. Power-factor varies from 50 to 85 per cent. High power-factor is difficult to secure as some of the large motors are likely to be loaded only lightly for a large proportion of the time in operation. Attempts have been made to use load equalizers but with indifferent success on account of the irregularity in the variations of load. This makes the use of flywheel effect difficult and in addition it would be expensive in first cost. The mill owner is little interested in the matter of smoothing out the load curve and such an installation would probably be objectionable to him. He is used to providing ample power capacity and is actuated by supreme disregard of fine points. To interest him it would be necessary to show that an equalization of power demand would add to the capacity of the mill or show a good return on the investment.

The next paper was by J. B. Fox and was entitled, "The Electrification of the Butte, Anaconda & Pacific Railway." Mr. Cox explained that his paper was still incomplete, as there had not yet been opportunity to compare the record of six months of electric operation with the previous steam operation.

Paul Lebenbaum stated that the Portland, Eugene & Eastern Railway operates about 45,000 train-miles per month electrically in passenger service, while the freight service is still operated by steam.

Charles P. Kahler pointed out some of the savings from electric operation as disclosed in the tables of Mr. Cox.

President Lincoln occupied the chair at the meeting on Friday morning. The first paper presented was by Girard B. Rosenblatt and was entitled "Application of Electric Motors to Gold Dredges."

Electric Motors for Gold Dredging.

Electric power has been applied almost universally to the operation of gold dredges of late, owing to its convenience and to the fact that hydroelectric power is available at very reasonable rates throughout the western states where gold dredging is carried on. There are a number of different motor applications on the elevator type of gold dredge, which is the type most generally used, and the author considers very fully the requirements of the various drives and the characteristics of the motors suited to the various operations of these dredges. Al-

ternating-current motors are generally used for these purposes and the type of control, which is of special importance, is considered. The paper also gives some figures on the cost of operation of dredges of different capacities.

The discussion was opened by Ralph W. Pope, honorary secretary of the Institute, who read a written discussion submitted by Ford W. Harris. Mr. Pope also gave some of his early experiences in the Fraser River Valley in British Columbia, where he thought gold dredges could be operated at a profit.

M. H. Gerry, Jr., disagreed with Mr. Rosenblatt and Mr. Harris as to the difficulty of application of electric motors to this work. He spoke of the massiveness and strength required by some of the dredge parts and pointed out that on one of the Ruby (Mont.) dredges the tumbler shaft which drives the digging bucket chain is of nickel-steel and 30 inches in diameter. He spoke favorably of the use of liquid rheostats for large dredges, while for smaller ones grid resistances are satisfactory.

Mr. Ross, a mining engineer, agreed with Mr. Rosenblatt that gold dredging is not essentially a mining problem but a manufacturing one.

R. F. Monges read a discussion prepared by H. M. Shepard.

A. A. Miller called attention to the large use of gold dredges in Dawson, Yukon Territory, where placer-mining companies are handling large quantities, which are supplied by transmission lines from hydroelectric stations. New dredges are being built each year.

In closing the discussion, Mr. Rosenblatt agreed with Mr. Harris that direct-current motors would be ideal for dredging purposes, but the cost of converting the power to direct current overbalances any advantages of the direct-current motor. The problem cannot be considered from the electrical side alone and cost considerations decide many of the details. The average life of a dredge is not over 10 years.

J. B. Fisken was called to the chair to preside during the presentation of a paper on "Economy in the Operation of 55,000-volt Insulators," by M. T. Crawford. In the absence of the author this paper was presented by J. Harisberger.

Economy in the Operation of 55,000-Volt Insulators.

The author gives a brief outline of the operating experiences on three 55,000-volt lines, two of which have been in service 10 years and one 5 years. The quality of the more modern porcelain insulators is notably superior to those first installed on these lines. A device is described by means of which defective insulators can be readily detected in the very early stages of deterioration, and by periodic use of this device and replacement of insulators, failures in service have been practically eliminated.

This paper was discussed by M. H. Gerry, Jr., V. H. Greisser, A. A. Miller, G. P. Nock, L. T. Merwin, L. J. Corbett, R. W. Pope, W. H. R. Fraser and Edward Woodbury. There was general opinion that porcelain is not subject to aging. It was brought out that no standard specifications are available as to what constitutes a perfect porcelain and it was suggested that glass insulators might be developed which would be suitable for high-tension work.

At the final session on Friday afternoon the Report of the Joint Committee on Inductive Interference to the Railroad Commission of California was presented by L. P. Ferris, who was the engineer in charge of the field engineering staff of the committee.

Report on Inductive Interference.

This report consists of an introduction, a summary of the principal results obtained to date, rules recommended for adoption by the Railroad Commission, a discussion of the rules, an outline of future work and six appendices. The latter deal with harmonics; balanced and residual voltages and currents; transpositions; the apparatus used in the investigation; a list of reports prepared; and a diagram showing the organization of the committee. The following are the main points covered by the rules, which have already been adopted by the California Railroad Commission and issued as a general order which shall apply to both new and existing construction.

Parallelism of lines shall be avoided as far as possible. It will be permitted only with a minimum horizontal separation between a power and communication line equal to the height of the taller line, and special means must be used for the prevention or limitation of residual currents and voltages, by which is meant the vector sum of the values for the several conductors of a power circuit. The telephone company shall have the right to specify the number, type and location of transpositions in the power circuit, except that the average distance between transpositions shall not be required to be less than two-thirds of a mile for 50,000 volts or over, nor less than one-sixth mile for less than 50,000 volts. No grounded single-phase nor grounded open-star transformer connections shall be employed on any power circuit involved in a parallel. Star-connected transformers with grounded neutral shall be employed only with delta-connected secondaries. A closed-delta connection is to be preferred to open-delta. Oil switches shall be employed between the parallel line and the source, with mechanical interconnections for simultaneous action. Air switches are prohibited except for isolating sections of dead line. The power circuit shall not be operated at any time with an open, grounded or short-circuited line wire or transformer winding. Indicating devices must be used. Records must be kept of the current in neutral ground connections. Voltage waves of generators must be sine waves. The rules do not apply to railroads operating alternating-current trolleys with ground return. Parallels of this nature must be avoided where possible.

The discussion was opened by P. N. Nunn, who stated that the magnitude of the subject and investigation is little realized. The investigation was started by the telephone interests for their protection and is antagonistic to the power companies. The report was worthy of a careful study as a scientific report of a scientific body. The proposals are not at all equitable, as the entire burden of improving conditions is laid upon the power companies. The changes in the customary apparatus are very extensive.

J. B. Fisken called attention to the impossibility of transposing a series arc circuit of the loop type.

A. H. Halloran read a discussion submitted by A. J. Boring. The telephone companies have been in the field longer than the power companies and have, moreover, spent much money to overcome the effects of inductive interference with only partial success, and they have now appealed to the power companies for assistance.

A. A. Martin supported the contentions of Mr. Nunn.

L. J. Corbett regarded the report as a valuable engineering contribution.

L. T. Merwin considered the report valuable from the scientific standpoint, but as useless for legal purposes. He expressed sympathy for the power companies operating in California.

In closing the discussion Mr. Ferris stated that a series arc circuit is considered as a constant-current system and not a constant-voltage system, and is therefore not subject to the rules adopted.

The convention then adjourned. A report of the separate sessions of the Northwest Power and Light Association will be given in a later issue.

Electrically Lighted Shelter at Street Corner.

A new shelter for patrolmen and pedestrians has been erected at the corner of Merchants Row and Center Street, Rutland, Vt. The building has an installation of incandescent lamps on the under side, while at the top is a ruby lamp of large candlepower, to denote the location of the shelter, which is sufficiently large to accommodate several people in case of sudden showers or stormy weather.

In Concord, Mass., more than two-thirds of the dwelling houses are connected for electric service. The rate for cooking and heating is three cents per kilowatt-hour.

New Electrical and Mechanical Appliances

New Single-Phase Motor for Small Installations.

The increasing applications of electric motors for operating various household appliances has created a demand for a single-phase motor that could be started with considerable load without blowing the relatively small fuses usually employed in residence circuits. Such a motor must have a large starting torque and yet low starting current.

A one-sixth-horsepower single-phase motor specially designed to meet these requirements has been developed and placed on the market by the Century Electric Company, St. Louis, Mo. It is of the same general type as the company's well known single-phase motors, which are of the repulsion-starting and induction-running type. It is capable of developing a starting torque more than two and one-half times full-load torque and this with a starting current of less than three times full-load current. When up to speed, this motor is capable of developing a maximum of about twice full-load torque.

Small Century Single-Phase Motor.

The new motor is of rugged and high-class construction. It has phosphor-bronze ring-oiling bearings, which makes it especially valuable for the operation of apparatus located in places subject to low winter temperatures. The shaft is accurately ground true to dimensions. A two by two-inch crown-face pulley is usually provided. The standard finish is black enamel.

These motors are wound, as the standard windings, interchangeably for 104 or 208 volts. This permits the manufacturer of small power appliances to equip his apparatus with motors and put the complete equipment in stock with reasonable assurance that the motor can be used on either of the prevailing voltages usually found in this country.

Although this motor has been on the market but a short time, it has already demonstrated that it fills a very promising demand since it is able to start practically any apparatus likely to be driven by a small motor without requiring a fuse larger than three-ampere rating.

Decorative Outdoor Receptacle.

A new type of outdoor receptacle has been designed by the H. T. Paiste Company, Philadelphia, Pa., for use on the Garden Pier, Atlantic City, N. J. These receptacles have plain yet graceful lines, and suit admirably the style of architecture. They are glazed a dark brown to harmonize with the tiling.

The binding-screws are well protected, and are center-spaced so that both wires may be bared at the same place. The wires are carried one inch above the surface wired over. Drip holes are provided from the screw shell. The center contacts are of phosphor bronze, as in all Paiste sockets and receptacles.

Receptacle for Garden Pier.

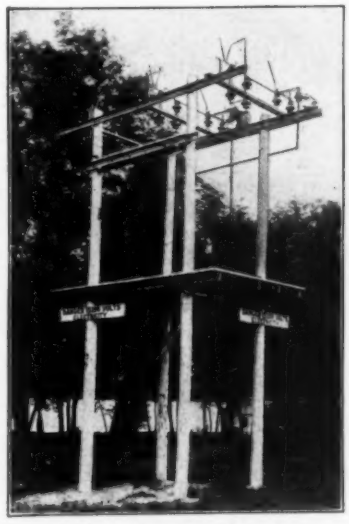
Test of Insulating Compound.

A test of G-K insulating compound, made by the Union Clay Products Company, New Brunswick, N. J., was reported on page 292 of the issue of August 8. At the time this test was made the voltage was gradually raised until breakdown occurred, but no evidence of puncture was visible on the outside of the compound. In this case the material was molded in a rectangular box containing two parallel wires 0.5 inch apart and an application of 81,400 volts for 70 seconds was necessary for breakdown.

The same sample after being heated at 200 degrees Fahrenheit for eight hours was again subjected to a breakdown test and failure occurred at 61,800 volts when applied for 60 seconds. No sign of failure could be noted on the surface of the insulating material. The sample was broken open and upon examination it was found that the puncture had not occurred between the parallel wires but had taken the following path. One of the porcelain knobs which supported the parallel wires had punctured. From this knob the voltage had arced part way through the bottom of the box to a nail driven through the side of the box into the bottom. From the nail the voltage had crept over the surface of the opposite knob to the other wire. This test was made by the Electrical Testing Laboratories, Incorporated, New York City.

Low-Cost Outdoor Substations.

The recent development of low-cost outdoor substations has opened up a new field for the sale of current from any high-tension transmission system. In the Middle West, the type of substation illustrated herewith is finding favor, owing to its low cost and general reliability.



Outdoor Substation, 13,200 Volts.

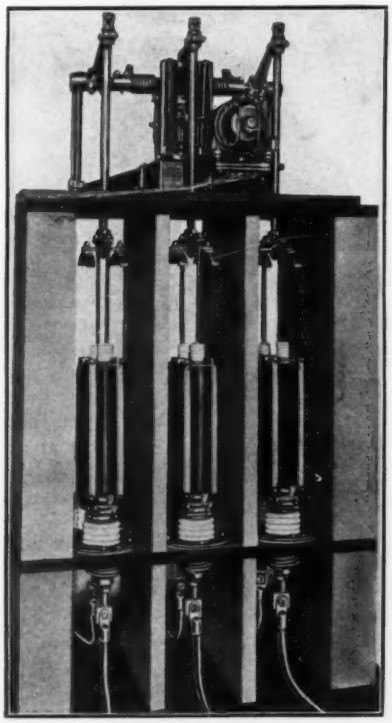
This 13,200-volt three-phase equipment is one of several standard designs sold by the Electric Appliance Company, Chicago, Ill., which supplies the entire equipment, including Packard transformers, Delta-Star high-tension units, line material, etc.

The air-break high-tension switch has extremely good operating characteristics, and oscillograph records do not indicate that line surges are set up at the time of opening. The transformers

are so connected that a very erratic path is interposed between the terminals and the discharge gaps, thus reflecting surges to, and discharging them on, the diverging horns.

Recent Improvements in High-Capacity Motor-Operated Oil Switches.

Recently the motor-operated type of oil switches manufactured by the General Electric Company has undergone some structural changes to make the circuit-rupturing parts more accessible for inspection, adjustment or repair. The cap on the oil vessel, as well as the lower oil-vessel clamp, have also been changed to allow bolting metal straps between the cap and clamp, as shown in the illustration. These straps

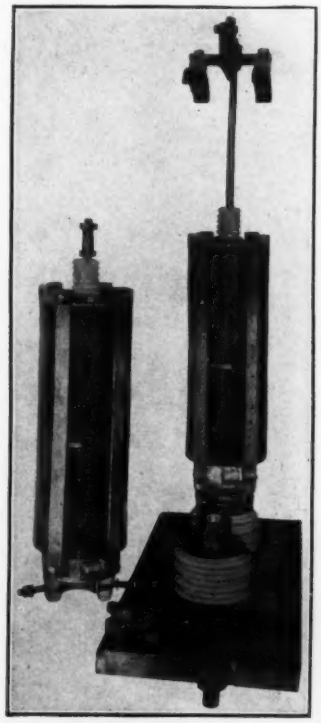


15,000-Volt, 1,200-Ampere, Triple-Pole, Single-Throw, Oil Switch.

have added considerable strength to the means for securing the cap in position, a valuable feature when the switch is called upon to open heavy overloads or short-circuits.

For inspecting readily the contacts and oil vessels, switches up to and including 3,500 volts embody easily removable features. These are shown in the illustration of a single pole of the switch, with one of the oil vessels and movable secondary and fixed contacts removed. Any such unit can usually be removed and replaced in a short time.

The operation of the renewal is as follows: open the switch, remove the unit at the top of the contact rod, loosen the clamping nut on the crosshead and push the contact rod down into the oil vessel; then loosen one swing-bolt nut on the oil vessel's lower clamp and remove the unit, consisting of the oil vessel and the fixed and secondary movable contacts.



Easily Removable Oil Pots and Contact Rods of Oil Switch.

Electrically Operated Service Recorders.

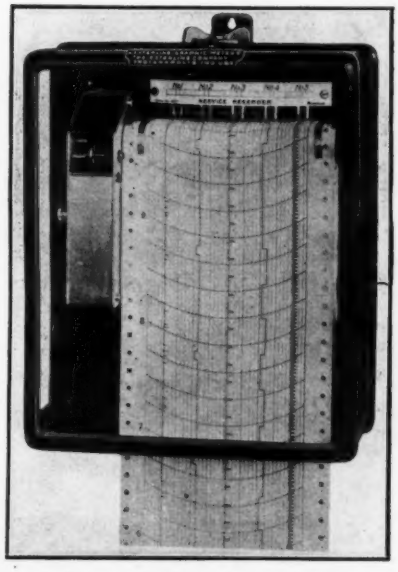
Keen competition in the manufacturing business has encouraged the development of a number of instruments and devices intended to increase efficiency in machine-tool operation. One of the most indispensable instruments of this type is generally known as the service recorder.

A new instrument of this type has recently been placed on the market by the Esterline Company. This meter operates on the same general principles as the common graphic or curve-drawing instruments. It is equipped with any number of pens desired, from one to ten inclusive. Each of these pens is controlled electrically.

The entire instrument is mounted in a handsomely enameled metal case with rubber-covered binding-posts located at the bottom for making connection. The case has suitable lugs at the top and sides for fastening to a wall or partition. The front cover of the case inclosing the chart and clock is provided with glass panels on the sides, top and front to permit inspection of the record without opening the instrument.

The pens rest on a long strip of paper or record chart, which is driven through the meter at a constant rate of speed by a high-grade jewel balance-wheel type eight-day clock. The clock may be equipped with gears giving five paper seeds of 0.75, 1.5, 3, 6 or 12 inches per hour. An attachment can also be provided on this clock giving additional chart speeds of 45, 90, 180, 360 and 720 inches per hour.

The clock is provided with stops so that its operation may be interrupted at any time. A regulator is furnished for adjusting the speed of the clock in service. Clocks are furnished with a rerolling device for winding up the finished record in the bottom of the case or this device may be omitted and the finished chart fed through a slot in the bottom of the cover, the record being torn off daily.



Electrically Operated Service Recorder.

Record charts are supplied in rolls 90 feet in length and 6 inches in width. This record may be torn up in short lengths for convenience in filing. Perforations are provided along each margin of the chart which are engaged by pins on the clock driving roll, insuring perfect alinement of the paper and accurate timing of the clock.

Each pen is so controlled that when a record is made a vertical line about one-eighth inch in length is drawn across the chart, the pen returning to the zero position after each record is made. The controlling devices for the various pens are connected to different machines in such a way that one record is produced for each operation or for a certain number of operations. On account of the paper traveling through

the meter due to the clock, the resulting record is a series of short lines, the spacings of which represent the rate at which operations are being completed. If the machine is being operated up to capacity, the series of lines will be close together, but if the machine stands idle for several minutes, a straight horizontal line will be drawn across the chart showing that no work was accomplished during this time.

The electrical control for the pens is very efficient and requires such a small amount of current that the power consumption is negligible. The instruments have high internal resistance and may be operated at any distance from the machines. One instrument may be located in the superintendent's or manager's office and operated by small wires connected to the machines located at various parts of the plant several thousand feet away. Any source of direct current, either storage battery, shop or trolley voltage, may be used for operating the instrument.

On machines operating at a high rate of speed and completing a number of pieces or operations in a short period of time, it is advisable to gear the controlling device on the machine so that one line on the chart will represent 10, 100 or any other convenient number of operations. On account of the large possible number of chart speeds that may be obtained on this instrument, it is easily possible to get suitable record on any class of work. If operations are completed at a slow rate, then the chart may be operated at a slow speed so as to shorten the record, but if operations are completed at a rapid rate, then a faster chart speed will give a clearer record.

These instruments are also furnished with a counting attachment arranged in such a way that they total up the operations, so that the total production for the day or period can be quickly determined direct from the recorders.

Service recorders are used for a variety of purposes in addition to machine-tool recording. Each pen can be arranged to give a record of when motors or other machines are being operated and when idle. They are also used for traffic recording on steam, interurban and street railways. In this case, each pen is operated by trolley contacts and records the exact time of cars passing a given point of the system.

The general design of case, clock and other parts of this instrument are identical with the standard line of curve-drawing electrical measuring instruments manufactured by the Esterline Company, Indianapolis, Ind.

Electric Steering-Gear.

The first Cutler-Hammer electric steering-gear equipment in a foreign navy is that on the Greek battleship *Kilkis*. This ship, which has been purchased from the United States, was formerly the U. S. S. *Mississippi*. The *Kilkis* is reported as having arrived safely at Athens.

A New Line of Boxes for Metal Molding.

A new line of boxes designed for use in connection with National metal molding has recently been designed and is being manufactured by James C. Phelps, Springfield, Mass. This type of box is a marked innovation in a number of ways. Its most distinctive feature is

Fig. 1.

that by simply turning the cover of the box any or all of the outlets may be opened or closed at will. No knockouts or similar arrangement is used. No bushings are needed in bringing the molding into the box; the latter enters the box directly and is held by a clamping screw against an abutment which serves as a bushing for the end of the molding base and cap.

A view of the box with a blank cover is shown in Fig. 1. Fig. 2 shows the box with an open cover and with attachment bar for securing a switch, receptacle or other fitting; this bar can be removed and the cover used as an open cover in connection with a fixture stud

Fig. 2.

or an insulating joint for hanging the fixture, or the opening can be fitted with an insulating plate threaded with three-eighth-inch pipe thread which will receive a five-eighth-inch brass fixture stem or three-eighth-inch socket or socket bushing. Figs. 3 and 4 show the new box and cover separately.

Fig. 5 shows the method of connecting the molding into the box. The base *D* of the molding as shown in this illustration is fastened under the screw *E*; the end joining the abutment *F* forms a bushing for the molding base. The capping of the molding is then snapped on as shown at *G*. When the cover is placed on the box the abutment *F* forms a bushing for the end of the capping.

From Figs. 3 and 4 it can be readily seen that it is possible to get eight different arrangements of the outlet in this box by merely revolving its cover; this cover is so arranged that it is not necessary in order to revolve it to un-

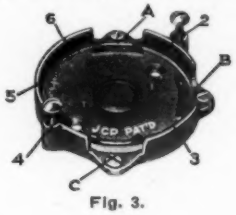


Fig. 3.

screw entirely the two screws that normally hold the cover in place. In order to show the eight different arrangements of outlets, if the point *1* of the cover in Fig. 4 is placed on point *A* of the box (Fig. 3) the outlet at *A* will thus be opened and the outlets at *B* and *C* closed. If the cover is turned until point *1* reaches point *2*, outlet *A* and *C* will be opened and *B* closed; if moved to point C, outlets *A*

Fig. 4.

and *B* will be closed and *C* opened; if moved to point *4*, all outlets will be opened; at point *5* all outlets will be closed; finally at point *6*, outlet *A* will be closed and *B* and *C* opened.

The use of this type of box, it will be readily seen, results in a large saving of labor in installing outlet boxes in connection with metal molding. The box is made of high-grade material and in connection with the open and closed

Fig. 5.

cover can be used as a junction box, switch box, fixture box and cord-drop box.

L. E. Frorup & Company, 232 Greenwich Street, New York City, are sole selling agents for this line of boxes.

Of 830 subways in Chicago carrying streets under the elevated tracks of steam railroads, the city lights 420 and the railroads 410. One 16-candlepower incandescent lamp is provided for each 400 square feet of area.

Meadows Safety Electric Washer.

The Meadows Manufacturing Company, Pontiac, Ill., has added to its line of power washers an electrically driven washing machine. In the design of this machine special care was taken to meet all the requirements of a machine for this service. This is evident from the selection of materials, the proportion and arrangement of the parts, and the guarding and safety features so liberally provided.

The tub of the outfit is made of thoroughly seasoned cypress wood, which is especially adapted for this purpose. The inner curved side and bottom of the tub is corrugated like a washboard to aid in cleansing the clothes by rubbing. Inside dimensions of the tub are 22 inches diameter at the bottom, 20 inches at the top and 12 inches high. A drain spout is provided at the back out of the way of the operator. The hinged lid for the tub is securely fastened. Castors permit the machine to be easily moved about.

Meadows Electric Washer.

Power is supplied by a one-fifth-horsepower electric motor, furnished for any voltage, frequency or kind of current available. A round belt connects the motor and main pulleys. No countershafts are used. The motor is mounted beneath the tub and is protected from splashing water. No starting box or clutch is needed for starting the motor, which is adapted to start under full load. The motor is first started by turning on the switch. By closing the lid the wooden dolly is thrown into gear and begins to churn and wash the clothes. Raising the lid instantly stops the washer. Nothing in the way of gears or other mechanism can be broken while lowering or raising the lid to start and stop the washer.

A specially constructed reversible wringer is used with the Meadows washer. It can be swung on a pivot and locked in any one of three different positions by simply letting loose a lever. A convenient hand lever controls the direction of rotation of the rolls. Pulling the lever permits the rolls to run forward. Pushing the lever permits the rolls to run in the reverse way. An additional and important safety feature is provided in the pedal, which must be pressed down with the foot to release a clutch that starts the wringer. Removal of the pressure on the pedal disconnects the wringer from its driving gear and stops it instantly. This control permits both hands to be free and guards against accidents. The wringer and washer can be run independently of each other or together at the same time.

All mechanical parts of the outfit are protected. It is impossible to get caught in the gearing. No shaft protrudes into the clothes, and the latter are not torn or injured in the washing process. The ready control of the wringer guards against tearing the clothes while wringing.

The wood parts of the machine are well varnished in natural wood finish. The tub hoops are bronzed. All metal parts in contact with water or likely to get wet are heavily galvanized. Other metal parts are painted with aluminum bronze. The entire outfit therefore is durably finished and neat in appearance. All bearings are designed to minimize friction and promote economical operation. An adjustable basket stand is furnished with each outfit.

Horizontal Fire Escapes.

The great hazard to life in buildings occupied by large numbers of persons has been shown in a number of disasters when fire broke out with large attendant loss of life. The great loss of life caused by fire and panic in what was known as the Triangle shirtwaist factory in New York City a few years ago directed attention to methods that would permit rapid vacation of the premises and would avoid the panic occasioned on crowded stairways, fire escapes or elevators.

A plan to solve this problem has been worked out by dividing the building by means of heavy fire walls into a number of small sections. The dividing wall extends from cellar to roof and has a doorway in it on each floor. In case a fire occurs on any floor on one side of the wall, a fire-alarm signal is immediately sounded to notify all the people on the floors on that side of the wall of the danger. This signal is understood by them to mean that they must pass immediately through the doorway into the safe section of the building, directly after which the fireproof door is tightly closed after them to form a barrier against the fire. On reaching the safe section of the building the people have opportunity to make calm use of the regular stairways, elevators and any fire escapes without serious crowding and so as to avoid entirely the panic that would result if the means of exit in the burning section were employed.

This method has been adopted in a number of industrial establishments, especially in and near New York City, and particularly in buildings of considerable height. Cases have occurred in which it has been found to work out with complete satisfaction. The success of this plan has therefore led to its adaptation to large public charitable institutions. At the suggestion of the charity and correction officials of New York City the plan is being adopted in the city's institutions on Blackwell's Island. These include a number of hospital, asylum and correctional institutions. In connection with hospitals the plan is believed to be the most sensible one, since bedridden invalids cannot be taken care of in the rush that would occasion if resort where necessary to the stairways, elevators and fire escapes in the burning section of the building.

This plan of the horizontal escape necessitates a special fire-alarm telegraph and gong-ringing system, which has been developed to a high state of perfection and the entire plan has met with the approval of fire-department officials. The horizontal-escape principle has been developed by H. F. J. Porter, consulting engineer for New York City.

The Canadian Northern Railway is building a 50,000-horsepower hydroelectric plant for operating its trains.

A New Line of Busbar Supports

The attention of electrical engineers has recently been attracted by the new designs of busbar supports and special porcelain recently put on the market by the General Devices & Fittings Company, Chicago, Ill. As these designs embody many new and decidedly radical features a description of the same is given below.

The first and most important feature of the busbar supports is the design of the porcelain part. In designing this part great care was taken to produce an even distribution of stresses and strains over and throughout the porcelain portion. The voltage requirements for safety-factor and the results of flash-over and arc-over tests were given great consideration. It is well known that a certain piece of porcelain will arc-over before puncture. It is not generally known, however, that cases exist where this particular piece of porcelain should puncture before flashing over.

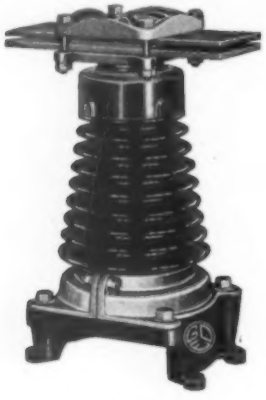


Fig. 1.

Fig. 2.

With the new high-frequency testing equipment one is able to determine absolutely where a piece of porcelain should be reinforced or the dielectric decreased. This means that some porcelain should be reinforced at the voltage point and weakened at the ground point, and other porcelain of similar nature should be reinforced at both points. These points were discovered through the aid of high-frequency tests. The manufacturer believes this one feature is the greatest advance that porcelain design has received in years.

Many tests and careful investigations of the use of cement in any form with porcelain have led the company to adopt mechanically cushioned clamps throughout its entire line. The dielectric change in porcelain due to the use of cement is understood today as being one of the factors that causes aging and fatiguing of porcelain carrying large currents, and this is the subject of a world-wide ceramic study by the best engineers. The General Devices & Fittings Company believes it is offering a product in porcelain entirely different from anything on the market and a long advance ahead of anything now produced.

Fig. 3.

Its patented pyramid-tye porcelain bus supports are designed with small thin corrugations beginning at the voltage point and tapering wider and deeper to the ground point, primarily to reduce the electrostatic field. This patented feature was brought out after a long series of tests and investigations to the end that a product could be produced that would give long life with the highest possible factor of safety and with the least expense.

Fig. 4.

Engineers are aware of the cost of upkeep and maintenance of porcelain now installed through constant replacement and renewals. Innumerable cases of complete shutdowns and outages are due to porcelain entirely. The larger the kilowatt capacity being supported, the greater should be the safety-factor and the more rigid the support to take care of this feature. The new line of supports provides a factor of safety of 4.5 to 12, depending on the service voltage impressed on the porcelain part.

It may interest some engineers to know that busbar equipments in certain plants have shown, by careful test, that they are subject to a magnetic pull as high as 455 pounds per lineal foot of bus. It is therefore obvious that proper bus supports should be specified to take care of these situations, knowing that this magnetic pull will be increased tremenduously through a short-circuit, motorizing inductive troubles, etc.

Fig. 5.

Many of the larger plants are trying to reduce this liability by the use of reactances, which are furnished for generator, busbar and feeder service. The generators can be wound with a pre-arranged percentage of reactance and have also an outside reactance as well. When one considers the enormous strain that is placed on bus structures through short-circuits, one naturally inquires where strain comes from. The ratio of full load to short-circuit on turbine-driven generators without reactances would in no case be less than three times and might be as high as fifteen times, depending upon the size of the unit and its regulation. With these facts before them, engineers are now taking great pains with their busbar equipment, and especially the supports for the same.

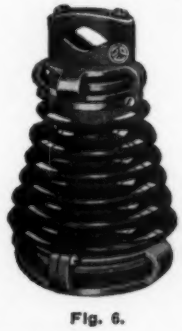


Fig. 6.

Of the illustrations herewith, Fig. 1 shows a busbar support for 22,000 volts

with a guaranteed test, all assembled, of 112,000 volts. This support carries a ceramic factor of 1.29, which is stated to be over 60 per cent greater than any support on the market. This support is set on an insert which was designed to be molded into the concrete floor of compartments. This is one of the company's patented features. All hardware, excepting the insert itself, is made of hard bronze. This busbar support will hold a strain exceeding 1,200 pounds per square inch. The cut shows two laminations of one-quarter-inch busbars with one filler. These supports are designed to hold any size or capacity of busbar. Fig. 2 shows a standard busbar support equipped for holding flat buses on the horizontal and for mounting on pipe frame, this support having two "U" bolts for this purpose.

Fig. 3 shows a busbar support for supporting buses in vertical position and for mounting on pipe frame. This pipe-frame support has a set-screw in the lower clamp to prevent the suport from turning on the pipe and is used where supports like Fig. 2 are too wide for close work. Fig. 4 shows another busbar support for mounting buses in a vertical position. It has a flat base and center-bolt clamping arrangement. It is a popular support for medium-sized busbar equipments and can be slipped over a bolt, which has been imbedded in the concrete structure, and turned in any position.

Fig. 5 shows a busbar support carrying a round bus of any description. It is shown with a skeleton type base for mounting on a flat surface. This base is popular and much in demand. Fig. 6 shows a busbar support for holding large insulated cables or bare cables, as the case may be, and is shown with a compartment-type base. This inclosed base is hollow in the bottom and drops over a stud, which may be cemented in the compartment floor. This type is much in demand where height is limited.

All the above supports can be furnished with any of the bottoms or any of the tops, to suit conditions. The support shown in Fig. 1 can be furnished either as a double support, three-way or four-way support, and arranged to carry buses on the vertical, on the horizontal, or special tubular buses. All supports can be adjusted to any angle by simply unloosening clamps. It may be interesting to note that the busbar support shown in Fig. 1 will carry 190,000 kilowatts and is being furnished for the first section of what will be ultimately probably the largest and finest power plant in the world.

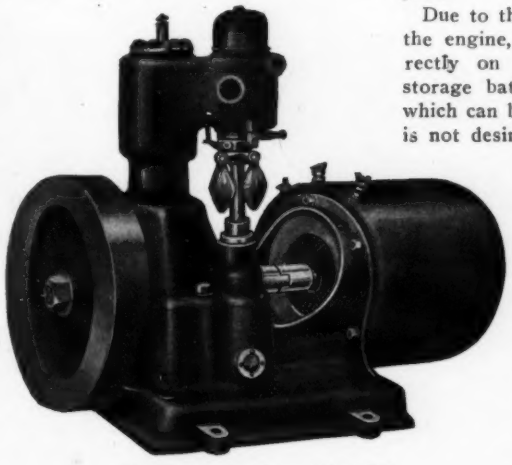
The Government of Honduras, Central America, is enlarging its electric light and power plant in Tegucigalpa, the capital city of the country.

New Generating Unit for Small Isolated Plant Service.

The accompanying illustration shows the new lighting and charging unit manufactured by the E. L. Russell Company, Indianapolis, Ind. This equipment is adapted for lighting service on farms, in country homes and other places where central-station service is not available. It is also furnished for storage batteries, operating moving-picture machines, wireless stations, village lighting service, etc.

The outfit is furnished complete with internal-combustion engine for gas or gasoline, generator, storage battery, instrument board, muffler, cooling tank, fuel tank and tools.

The engine is of the new patented "Silent Valve" construction which has recently been placed on the market by the above named company. The valve in this design consists of a tempered metal part provided with large ports



"Silent Valve" Generating Set.

for the rapid ingress and egress of the gas, located in a seat of corresponding taper. Means are provided at the upper end of the valve shaft for automatically adjusting the valve to and from the seat to compensate for variations in size due to heat or wear. It is claimed that the valve will operate throughout the life of the outfit without requiring any regrinding. The valve being positive in action, it is also claimed that it makes the engine easier to start, gives better regulation, less vibration and noise, and greater reliability than the poppet type of valve. It also eliminates any trouble due to the valves sticking.

The engine is of the four-cycle water-cooled type. It is lubricated by the splash system, the crank case forming the oil reservoir in which the oil level is maintained automatically by a supply tank located on the outside. One valve is used to operate the inlet and exhaust of one or two cylinders, depending upon the size and type of engine, thus reducing the number of parts over those required with engines equipped with any of the other types of valves.

Another advantage claimed for the "Silent Valve" construction by the manufacturer is that this type of valve permits of a much higher engine speed than other types. A much smaller and more compact generating unit can therefore be used for a given kilowatt capacity. The outfit illustrated has a capacity of 1.5 kilowatts with a 20 per cent overload capacity. The dimensions of the complete outfit are: Height, 22 inches; length, 31 inches; width, 15 inches.

The generator is a special high-speed type manufactured by the Robbins & Myers Company, Springfield, O. It is direct-connected to the engine shaft and is supported by the engine base. Forty-volt outfits are regularly supplied.

Due to the close speed regulation of the engine, the lamps can be run directly on the generator circuit. A storage battery is provided, however, which can be used for the load when it is not desirable to operate the engine. The outfit is very quiet in operation and can be installed in the basement of the home.

The outfit is started from the battery, the generator acting as a motor. As soon as the engine is started, the generator starts automatically to charge the battery. When the batteries are charged, the engine is stopped automatically. In addition to the starting and stopping switches, the instrument board is equipped with a voltmeter, ammeter, circuit-breaker and fuses.

The standard lighting outfits are regularly furnished in three sizes with capacities of 0.75, 1.5, and 3 kilowatts, for 35, 75 and 150-lamp installations.

In addition to the lighting outfits, the E. L. Russell Company also furnishes "Silent Valve" engine outfits for operating pumps, air compressors, sprayers, refrigerating machines, etc.

Electric Cooking in Railroad Restaurant.

Passengers over the Oregon Short Line Railroad will be served with electrically cooked meals at Pocatello, Idaho, where electric cooking apparatus is being installed in the new station restaurant. All the mixing, baking and cooking in this model kitchen will be done by electricity.

A Portable Motor-Operated Air Compressor.

The small motor-driven air compressor illustrated herewith is exceedingly useful in mines, industrial plants, etc., for supplying air for rock drills, hammer drills, pneumatic tools, coal-pick machines and post punchers.

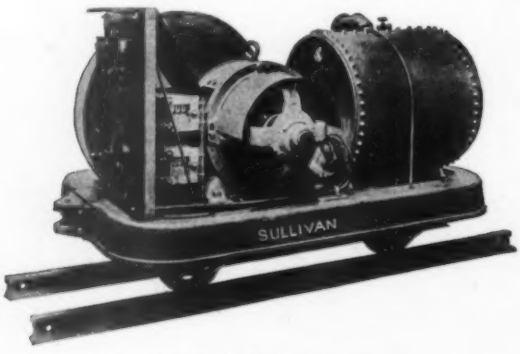
The complete unit is mounted on a truck of any desired wheel gauge and comprises a 15-horsepower Westinghouse electric motor, the air compressor, a storage tank and a motor-starting rheostat.

The motor is of the damp-proof type and will operate successfully in the wettest portions of the mine. Either alternating or direct-current motors are supplied.

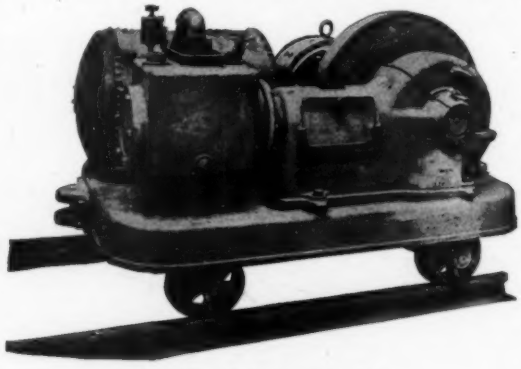
The receiver is made of plate steel and is tested to withstand 100 pounds air pressure. With it are furnished a pop safety valve, pressure gauge, and blow-off or drain cock.

The construction of the air compressor is very substantial. Its bearings are all adjustable and removable. The cylinder is lubricated by a sight-feed air-cylinder lubricator and the crank shaft and crosshead by the splash system. An unloading device on the air-inlet valves saves energy when the demand for air is less than the output of the machine.

This compressor outfit is manufactured by the Sullivan Machinery Company, Chicago, Ill.



Portable Motor-Driven Compressor.



Rear View of Compressor Set.

The New Chicago Grip as a Universal Grip.

The lineman who puts up telephone, telegraph, electric light and power service wires on pole lines, needs a wire grip universally adaptable to both iron and copper wire. The new Chicago grip is a grip with which he can pull in slack, dead end, cut out slack, and haul in ends to be joined. The grip holds itself in position wherever placed, leaving both hands free to make the joint, and when used in connection with the lineman's self-locking slack tackle, the snubbing of the loose block rope end is but the work of a second, as by a slight sideward movement the rope is held in the notch hook, which is a part of the pulley block; then both hands are free, giving the lineman practically four hands, two represented by the grips holding the wire, and two free hands to work with in making a joint or other work he may be engaged in.

New Chicago Grip.

The grip is made in several sizes, a very light one for No. 10 telephone wire, a next size for No. 6, one for No. 0, and one for No. 0000. It can be furnished for bare and insulated wire and as well for 500,000 circular-mil aluminum stranded wire. It is made of forged steel and has all the ear marks of thorough workmanship. It is well proportioned for strength and shaped so as to be handled easily and quickly. It pulls straight, leaving no kinks in the wire. Its excellent design and construction assures linemen good results, permitting them to give undivided attention to the proper accomplishment of the work in hand and thus secure the consequent efficiency and durability—results looked for by the management of successful corporations.

Self-Locking Slack Tackle.

This grip is manufactured by the well known tool makers, Mathias Klein & Sons, Chicago, Ill.

South African Municipal Plant to be Enlarged.

The municipal electric plant at Port Elizabeth, South Africa, is to be enlarged at an eventual cost of over $200,000. The town engineer and municipal council are waiting for the sanction of the provincial administrator before proceeding.

For convenience, the work will be divided into three sections. No. 1 section comprises the engine-room work, No. 2 the boiler room, and No. 3 the cables. The work will be let under three separate contracts.

The first section is estimated to cost $80,000 to $85,000 to complete, the second about $45,000, and the cable section about $30,000. In addition there will be transformers, a substation plant, and switch gear to be supplied. The balance of the money is expected to be used for motors, installations, etc.

Full information, with blue prints, is contained in pamphlets that will be loaned on application to the Bureau of Foreign and Domestic Commerce, Washington, D. C. Tenders will probably be called for in London and in South Africa simultaneously.

Manufacturers not having representatives in South Africa should submit tenders through the agents of the municipality, Davis & Soper, 54 St. Mary's Axe, London, or direct to the Port Elizabeth Municipality through the city clerk.

The Swedish Government is constructing hydroelectric power stations at Dalelf and Porjus in Lapland. When these stations are completed, electricity will be used as motive power on all the government-owned railways in northern Sweden.

Current Electrical News

NORTH ATLANTIC STATES.

BARTON, VT.—Independent Telephone Exchange capitalized at $200,000, has filed papers of incorporation. E. A. Cook, of Lyndonville, is one of the incorporators.

AYER, MASS.—The selectmen have granted pole locations to the Shirley Electric Company on Shaker Road, where the company is to build high-tension line from Wilds Road to a point near Samson Cordage, and a transforming station will be built in the mill yard.

LEOMINSTER, MASS.—Samuel Haskell, inspector of wires, has completed plans by which a system of underground conduits will conceal electric wires from view in the vicinity of the municipal building.

READING, MASS.—A special town meeting has been called for September 14 in order to provide $8,000 for local electric light extensions locally.

HARTFORD, Conn.—Consent has been given to Union Electric Light and Power Company to erect poles and string wires to carry 22,000 voltage in Farmington from Knotts Corner to Avon.

HAMILTON, PA.—Electric lighting will be furnished to the village of Millville, west of here if the plans which are now under way will be carried out. Director of Public Service Joseph Meyers, who has charge of the electric-light department, is in favor of the plan if enough subscribers can be secured. S.

KITTANING, PA.—As the result of a favorable vote on a bond issue of $112,000 a new electric plant will be installed in the near future. S.

SOUTH ATLANTIC STATES.

HIGH POINT, N. C.—North Carolina Public Service Commission contemplates installing an ornamental street-lighting system in the business district to consist of 60 standards carrying five 60-watt lamps.

WALTERBORO, S. C.—The city will vote October 8 on $15,000 bonds to construct an electric light system. Address the mayor for further information.

QUITMAN, GA.—The issuance of $40,000 of municipal bonds for improving electric light plant and for other purposes has been voted. Address the mayor for desired information.

OCALA, FLA.—An election will be held October 27 upon the issuance of $50,000 of municipal bonds for enlarging the electric lighting plant and improving its equipment, and for other purposes. The mayor may be addressed in regard to this matter.

NORTH CENTRAL STATES.

NORWOOD, O.—The promoters of the proposed traction line between Norwood and Middletown, O., are planning to extend the road to Dayton, according to Michael Klaiber, Jr., of Reading.

PIQUA, O.—The Pioneer Pole & Shaft Company is considering electrifying its Louisville, Ky., plant, formerly operated by the W. J. Gillette Manufacturing Company. G.

AMO, IND.—The Amo Light, Heat & Power Company has been incorporated, capitalized at $3,000, by W. W. Cosner, E. B. Owen and J. E. Hodson.

WEST TERRE HAUTE, IND.—West Terre Haute Utilities Company has been incorporated with a capital of $45,000 by John Schwartz, James A. Reed and George L. Berry.

PEORIA, ILL.—Bids are being asked for the electrical work in connection with the erection of the German-American bank here. Lampitt & Son, of this city, have the general contract. Z.

SIBLEY, ILL. — Municipal light bonds have been authorized.

SAGINAW, MICH.—The Council now has a petition before it bearing names of 524 citizens of Saginaw asking for the submission to the electors of a proposition for a bond issue of $250,000 with which to erect a municipal electric lighting plant.

ORFORDVILLE, WIS.—The village Board has granted a franchise to the Orfordville Light & Power Company to erect a lighting system. Address the village clerk for desired information.

SCHLEISINGERVILLE, WIS.—This village, at a special election held recently, voted for bonding the village to the sum of $6,000 to install a transmission system for electric current. The electric current is to be derived from the plant in Hartford. With the latter the village will enter a contract for five years, which can be extended another five years. The work of building the line will be started at once.

TWO RIVERS, WIS.—This city will install an ornamental system of street lighting on the downtown streets. Address the city clerk in regard to this work.

BUHL, MINN.—Bonds have been voted for improving the municipal power plant. Address the village clerk.

DULUTH, MNN.—The Hillside Improvement Club will ask for a better lighting system on a section of Fourth Street. Address the city clerk for particulars.

BUFFALO, IOWA.—A $4,000 electric plant will be installed here. Address the city clerk in regard to the contract.

KANSAS CITY, MO.—Cowgill Garage & Light Company is reporting contemplating building an electric light plant.

KANSAS CITY, MO.—Messrs. Wilder & Wright, architects, have prepared plans for a $400,000 hospital. The specifications include an electric power plant. Address William Brophy for desired information.

HEOLA, S. D.—A petition is being circulated for a new electric light system. Address the village clerk for information.

NORTH BEND, NEB.—$21,000 in bonds have been authorized for an electric light system. Address the city clerk for information in regard therto.

OMAHA, NEB.—A. C. Arends, concrete engineer, is making plans for an electric light plant at Alliance.

KANSAS CITY, KANS.—The bonds for electric light plant improvements are advertised to be sold October 1, after which bids for materials and work will be advertised for. M.

LEAVENWORTH, KANS.—This company has just closed a contract with the city of Leavenworth for lighting a "White Way" to consist of 70 five-lamp standards, to be increased later to approximately 150 standards.

SOUTH CENTRAL STATES.

CARLISLE, KY.—The Carlisle Light & Power Company is to be awarded a new franchise, following which the plant will be enlarged and improved and ice manufacturing equipment operated in connection with it. G.

SHREVEPORT, LA.—At a recent meeting of Eastern & New Orleans capitalists with directors of the North Louisiana Electric Railway Company a contract was closed for the immediate construction of an interurban electric railroad between Shreveport and Monroe, La., to cost approximately $4,000,000.

SHREVEPORT, LA.—An ordinance has passed the Council authorizing the secretary-treasurer to advertise for bids for material and equipment for improving the underground fire-alarm system. Address the mayor for general information.

LITTLE ROCK, ARK.—The Arkansas Light & Power Company, capitalized at $650,000, has been incorporated. The company will have its business office in Little Rock, but will operate in the cities of Arkadelphia, Camden, Malvern, Magnolia and such other points as it may choose. It is authorized to build, equip and operate power plants, sell current, etc. The company is already erecting a power plant at Malvern from which power will be distributed at Arkadelphia. H. C. Couch is president and J. L. Longino is secretary.

WALDRON, ARK.—Waldron Telephone Company has been incorporated with a capital of $7,500.

POND CREEK, OKLA.—The city council has passed an ordinance authorizing $7,000 bonds to improve the electric-light plant and water works. Address F. J. Gentry, mayor.

WESTERN STATES.

WHITEFISH, MONT.—Bids for furnishing materials and installing an electric lighting system will be received shortly by the city clerk of this municipality. Plans and specifications for the proposed improvement are practically completed. O.

BOISE, IDAHO.—The contract which the city has with the Idaho-Oregon Light & Power Company for installing lamps and furnishing power for lighting the streets of South Boise will be cancelled and the city will install its own system and attach to the rectifiers which have been installed for use in the central street system. This action was decided upon by the City Council.

LEHI, UTAH.—The pumping plant installed by the Provo River Reservoir Company near Saratoga Springs at the north end of Utah Lake, will be enlarged. The plans call for the extension of the present building and the installation of six 400-horsepower motor-driven centrifugal pumps each with a capacity of 20 cubic feet per second, which will more than double the capacity of the present pumping plant.

MONTESANO, WASH.—The Northwest Electric & Water Company is making plans for improving the local service, especially in the electric lighting department. The power plant is to be enlarged and the transmission lines extended. O.

SEATTLE, WASH.—E. P. Kennedy, of Seattle, head of the Speel River Power Company, which recently obtained a government grant for the construction of a hydroelectric chemical and power plant on the Speel River, near Juneau, Alaska, is authority for the statement that active construction on the proposed plant will begin in a few weeks. The plant will supply current for light and power to this city and nearby territory. O.

WILBUR, WASH.—The City Council has awarded the contract for furnishing this city with current for light and power for the coming year to the Washington Water Power Company, of Spokane. From all reports it is understood that some needed extensions and improvements are contemplated by the power company. O.

ASTORIA, ORE.—A wireless station of 25-kilowatt capacity, costing $80,000 consisting of four steel towers on a concrete base, is to be erected here in the immediate future by the Marconi Wireless Telegraph Company. O.

DALY CITY, CAL.—Plans are being drawn up for the reconstruction of the entire lighting system of this city.

LOS ANGELES, CAL.—The Board of Supervisors of Los Angeles County has authorized the creation of two new lighting districts to be known as the Lancaster and Newhall Districts.

RIVERSIDE, CAL.—The installation of an ornamental lighting system on Seventh Street will proceed at once, no protests against the proposed system having been made.

SACRAMENTO, CAL.—The Sacramento Electric Company has been incorporated with a capital stock of $50,000 by F. W. McAvoy, H. F. Yost and D. Fitzsimmons.

UKIAH CAL.—The Snow Mountain Water & Power Company has engineers at work in connection with the reconstruction of its plant. The company has applied to the Railroad Commission for permission to lease a portion of its property to the California Telephone & Light Company.

PROPOSALS.

WIRE CABLE.—Sealed proposals will be received by the general purchasing officer, the Panama Canal, Washington, D. C., until September 30 for furnishing wire cable as per Canal Circular No. 868. Copies of specifications may be obtained from any of the assistant purchasing officers located in all of the large cities of the United States.

MOTOR-DRIVEN FANS.—Sealed proposals will be received at the office of the Engineer Depot, United States Army, Washington Barracks, D. C., until September 28 for furnishing one motor-driven ventilating fan coupled to and driven by a 110-volt three-phase 60-cycle squirrel-cage induction motor. For further information apply to Joseph E. Kuhn, lieutenant colonel, engineers.

ELECTRIC LIGHTING SYSTEM.—Sealed bids will be received September 24 for labor and materials required in the construction of an electric lighting system for the village of Ceylon, Minn., according to plans and specifications which are on file in the office of F. H. Koenecke, village recorder, Ceylon, Minn., and also in the office of Earle D. Jackson, consulting engineer, St. Paul, Minn.

ELECTRIC-LIGHT FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until October 13, for the interior lighting fixtures of a one-story building for the post office at Shelbyville, Tenn., and until October 19 for the same for a one-story building for the post office at Portland, Ind., in accordance with drawings and specifications, copies of which may be obtained either from the office of the Supervising Architect or the custodians of the sites named.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until October 6 for furnishing the following electrical equipment for the Navy Yards named and under the schedule numbers given: miscellaneous bells and buzzers, nonwater-tight; 30 water-tight buzzers; 1,000 feet rat-tail rubber-insulated wire; 300 Leyden jars; all under Schedule 7326, for Brooklyn, N. Y.; 3,550 feet interior-communication cable and 5,300 feet leaded and armored twin conductor, 7303, Brooklyn, N. Y.; 500,000 feet interior-communication cable, 15,000 feet telephone cable, 187,600 feet leaded and armored twin conductor, miscellaneous leaded and armored twin conductor, 20,000 feet armored twin conductor, 7304, Brooklyn, N. Y.; miscellaneous black insulating material and five portable searchlights, 7312, Brooklyn, N. Y.; one direct-current motor, 7312, Annapolis, Md.; 10 single-phase induction fans, 7321, Brooklyn, N. Y.; miscellaneous electric fittings, 7321, Washington, D. C. The Bureau will also receive proposals until October 13 for furnishing miscellaneous portable voltmeters and ammeters, as per Schedule 7337, for delivery at the Navy Yard, Mare Island, Cal.; and until October 27 for 160 electric switches, as per Schedule 7315, for delivery at Navy Yard, Pearl Harbor, Hawaii.

NEW INCORPORATIONS.

ST. JOSEPH, MO.—St. Joseph Battery Company has been incorporated with a capitalization of $30,000 by H. D. Brach, A. C. Owens and L. C. Bauman.

PRAIRIE FARM, WIS.—Prairie Farm Electric Company has been incorporated with a capital of $5,000 by O. A. Osterich, L. A. Avery and Leona Westlake.

ONTARIO, WIS.—The Farmer's Store, Light & Power Company has been incorporated with a capital of $100,000 by Charles M. Sandon, E. E. Hill and Fred A. Johnson.

CLEVELAND, O.—The Pequez Electric Company has been incorporated with a capital stock of $10,000 by W. S. Seabury, R. E. Seabury, R. B. Smith, J. L. Huston and N. A. Huston.

MILWAUKEE, WIS.—Western Utilities Company has been incorporated with a capital stock of $25,000 by George H. Dixon, S. S. King and B. M. King. The company will deal in electric motors, etc.

BOSTON, MASS.—Seth W. Fuller Electric Company has been incorporated to deal in electrical appliances. The capital stock is $50,000 and the incorporators are G. C. Willis and D. F. Cunningham.

MANHATTAN, N. Y.—Sharfink Electric Manufacturing Company has been granted articles of incorporation, capitalized at $10,000. The incorporators are M. F. Finkelstein, F. Schwartz and B. Kaplan.

PITTSBURGH, PA.—Electric Engineering & Manufacturing Company, Pittsburgh, Pa., has been incorporated, capitalized at $5,000. The incorporators are W. F. Knoell, A. W. Forsythe, Pittsburgh, and R. S. Chess, Crafton, Pa.

SCHENECTADY, N. Y.—The Hallbauer-Hardman Manufacturing Company has been incorporated to deal in electrical apparatus, etc. The capital stock is $10,000 and the incorporators are August F. Hallbauer and Thomas Hardman and Albert B. Van Voast, of Schenectady.

EASTON, PA.—A charter of incorporation has been granted to the Butler-Edwards Electric Company, having a capital of $5,000. The incorporators are Neilson Edwards, M. F. Butler and Alexander C. Groome. Mr. Edwards is the treasurer. The company will manufacture and sell electrical machinery and appliances.

BRISTOL, CONN.—Papers of incorporation have been filed for the Ward Smith Electric Company with a capitalization of $2,000. The incorporators are Leland Adelbert Ward, Dr. C. Art Ward, of Forestville, and Tryon Smith, of New Britain. A general electrical business will be conducted by the firm, which will start at once at Naugatuck.

OGDEN, UTAH.—Articles of incorporation have been filed for the Central Heating & Power Company, the principal object of which is said to be the building of a plant to furnish heat and power to several local concerns. The capitalization is given at $25,000; the incorporators are R. B. Porter, president; F. J. Kiesel, vice-president; Charles Zeimer, secretary, and Albert Scowcroft and D. C. Eccles.

FINANCIAL NOTES.

Reports from 26 public utility corporations, in which William P. Bonbright & Company are interested, operating in various sections of the country, show good results for July, 1914. Of the 26 corporations only seven showed decreases in gross earnings as compared with July, 1913, and these were small, the largest decrease being $12,431, and this, by lower operating costs, was turned into an increase of $1,556 in net. Combined gross of the 26 companies for July, 1914, was $4,754,979, an increase of $431,222 as compared with July, 1913, while net was $2,340,137, a gain of $388,039.

Earnings of the public utility properties operated by H. M. Byllesby & Company, which consist of the operating subsidiaries of Northern States Power, Consumers Power of Minnesota and Standard Gas & Electric are reporting good gains for the current year over 1913. A consolidated statement of earnings of all these properties for July, 1914, shows gross of $1,062,552, a gain of $22,996 or 2.2 per cent. Economies put into effect within the last year have resulted in saving in operating costs so that combined net earnnings for July were $470,634, an increase of $24,899, or 5.5 per cent over the month of July, 1913.

Judge Lacombe allowed, in the Federal District Court, in accordance with the mandate of the United States Circuit Court of Appeals, claims made by the Second Avenue Railway Company and its receiver, George W. Linch, and by the Guaranty Trust Company for $594,727 against the New York City Railway Company. Of this amount the court said that the New York City Railway Company was liable as lessee for $275,391 for the special franchise taxes of the Second Avenue Company for the years 1902 to 1906, with interest to September 24, 1907, and for $319,335 as damages for failure to maintain the property of the Second Avenue Company in proper condition from April, 1902, to October, 1907.

Birmingham, Ensley & Bessemer Railroad Company, which was placed in the hands of I. W. Ross, general superintendent of the company, as receiver on account of default in bond interest due September 1, is expected to be put through an early reorganization. It is stated that a complete financial statement, down to September 1, is being prepared and will be issued soon and that all liquidated and undisputed liabilities down to that date have been taken care of.

Dividends.

	Term	Rate	Payable
Asheville Pr. & Lt. pf	Q	1.75%	Oct. 1
Bell Tel. of Canada	Q	2%	Oct. 15
Buffalo Gen. Elec.	Q	1.5%	Sept. 30
Cal. Ry. & Pr., pf.	Q	1.75%	Oct. 1
Can. Gen. Elec.	Q	1.75%	Oct. 1
Can. Gen. Elec., pf.	S	3.5%	Oct. 1
Can. Westghs.	Q	1.75%	Oct. 10
Carolina Pr. & Lt., pf.	Q	1.75%	Oct. 1
Chgo. City Ry.	Q	2.5%	Sept. 29
Cin. & Sub. Bell Tel.	Q	2.5%	Oct. 1
Detroit Edison	Q	1.75%	Oct. 15
East Mich. Edison	Q	1%	Oct. 1
Elmira Water, Lt. & R. R., 1st pf.	Q	1.75%	Oct. 1
Elmira Water, Lt. & R. R., 2d pf.	Q	1.25%	Oct. 1
Honolulu Rap. Tr. & Land	Q	2%	Oct. 1
Manhattan Ry.	Q	1.75%	Oct. 1
Muskogee Gas & El., pf.	Q	1.75%	Sept. 15
Narra. Elec. Lt.	Q	2%	Oct. 1
Toronto Ry.	Q	2%	Oct. 1
United Lt. & Rys., 1st pf.	Q	1.5%	Oct. 1
United Lt. & Rys., 2d pf.	Q	0.75%	Oct. 1
Wash., Balt. & Annap., pf.	Q	1.5%	Sept. 30
Western Elec.	Q	2%	Sept. 30
Western Union	Q	1%	Oct. 15

Reports of Earnings.

COMMONWEALTH POWER, RAILWAY & LIGHT. AND SUBSIDIARY COMPANIES.

	1914	1913
July gross	$ 1,201,963	$ 1,156,553
Net after taxes	617.399	472,128
Surplus after charges	158,587	150,443
12 months' gross	14,616,878	13,744,593
Net after taxes	6,271,294	5,856,713
Surplus after charges	2,215,479	2,130,109
Balance after preferred dividends	*1,255,479	1,170,109

*Equivalent to 8.1 per cent on common stock.

KEYSTONE TELEPHONE COMPANY.

	1914	1913	1912
August gross	$112,546	$105,267	$101,128
Net after taxes	58.938	52,056	48,525
Surplus after charges	32,901	26,539	23,049
8 months' gross	880,262	837,106	799,779
Net after taxes	446.810	412,615	396,409
Surplus after charges	238.957	209,833	195,369

PUGET SOUND TRACTION, LIGHT & POWER.

	1914	1913
June gross	$ 668,255	$ 683,957
Net after taxes	254,746	281,394
Surplus after charges	78,087	109,433
Twelve months' gross	8,701,960	8,377,565
Net after taxes	3,642,788	3,476,094
Surplus after charges	1,546,175	1,450,200

OTTUMWA RAILWAY & LIGHT.

Twelve months ended July 31, 1914:

	1914.	1913.
Gross earnings	$324,446	$312,027
Net after taxes	146,194	139,234
Surplus after charges and preferred dividends	47,433	41,308

UNITED RAILROADS OF SAN FRANCISCO.

Income account year ended June 30, 1914:

Gross operating revenue	$8,506,725
Operating expenses	5,226,536
Net operating revenue	3,280,188
Non-operating revenue	180,907
Gross income	3,461,095
Deductions from income	157,030
Fixed charges and sinking funds	2,404,760
Net income	899,305
Depreciation reserve	255,201
First-preferred dividends	350,000
Surplus	294,103

PERSONAL MENTION.

MR. C. LOUIS ALLEN, formerly automobile sales manager of the Pyrene Manufacturing Company, New York City, makers of the Pyrene hand fire extinguisher, has been promoted to the position of general sales manager.

MR. WILFORD CLYDE has resigned his position as superintendent of the municipal plant at Springville, Utah, to accept a position in the commercial department of the Utah Light & Railway Company, Salt Lake City.

MR. W. B. VOTH has been appointed chief engineer of the Empire United Railways of New York, with headquarters at Syracuse. Mr. Voth has been superintendent of light and power for 10 years for the Sheboygan Railway & Electric Company, Sheboygan, Wis.

MR. W. H. FELLOWS, manager of The Leavenworth Light, Heat & Power Company, has resigned to take effect October 1, after 16 years' service with the company. For 12 years he was superintendent of the construction and operation of the electric department, and for four years served as vice-president and manager of the combined gas and electric properties. His successor has not been appointed as yet.

MR. S. R. GALLAGHER, contracting agent of the Springfield Gas & Electric Company, Springfield, Mo., was the managing host at an electric banquet given at the recent Pure Food Show held at Springfield. The biscuits were electrically baked, the flour furnished by a local milling company, the milk-fed spring chicken was roasted to a delicate turn, and the coffee was poured from an electric percolator. It was a home-product banquet as well as an electrical demonstration.

MR. VAN RENSSELAER LANSINGH, until recently manager of the department of the National Lamp Works, having supervision over the manufacture and sale of reflectors, has become associated with the Hardware Buyers' Association, with headquarters in the Lytton Building, Chicago. Mr. Lansingh was for years connected with the Holophane Company and was one of the founders of the Illuminating Engineering Society, filling several offices in that organization, which culminated with his election to the presidency in 1911.

MR. W. L. LAFEAN has accepted the position of secretary and treasurer of the Naugle Pole & Tie Company, Chicago, succeeding the late MR. J. W. BENHAM, who was killed in an automobile accident near Ravinia Park July 27. Mr. Lafean is not a stranger in the electrical business, nor in the pole business, having been financially interested in the Naugle Company for the past five years through the Shaw Estate, which has held a large financial interest in the company since that time. Mr. Lafean will pay special attention to the producing and financing ends of the company's business.

MR. HAROLD K. WELD has joined the field force of the Standard Underground Cable Company as engineering salesman, with headquarters in Chicago at 209 South La Salle Street. Mr. Weld was for five years connected with the Chicago Telephone Company, and later for three years with the McRoy Clay Works, so that he has had considerable experience with engineering connected with underground-cable and conduit work. On September 2 Mr. Weld was married at Kalamazoo, Mich., to Miss Lela Maude Raymond, and has taken his bride to Oak Park, a beautiful residence suburb of Chicago, where Mr. Weld's home has been for many years.

MR. W. H. ROGERS, an expert in the power and mining department of the General Electric Company, at Schenectady, N. Y., has been detailed by his company to make an investigation of the problem of electrifying the steam shovels of the Utah Copper Company at Bingham, Utah. The steam-shovel operations of this company are said to be the largest in the world. An entire mountain of low-grade copper ore is being eaten away by 30 to 40 monster steam shovels which are constantly in operation. The problem presented in the electrification of these steam shovels is an extremely difficult one, but President D. C. Jackling, of the Utah Copper Company, who is also president of the Utah Power & Light Company, from whom the Utah Copper Company purchases its supply of power, is extremely anxious to see this electrification effected.

MR. J. A. BRETT, Cincinnati, O., representative of the Westinghouse Electric & Manufacturing Company, was host on September 10 to a number of district managers of the company passing through the city *en route* to Hot Springs, Va., from the West and South, to attend the company's sales conference. A dinner at the Zoo Clubhouse was a pleasant

feature of the entertainment afforded by Mr. Brett, which was attended by a number of guests, including prominent local men connected with electrical industries. Among these were Walter A. Draper, vice-president and secretary of the Cincinnati Traction Company and the Ohio Traction Company; Thomas V. Elliott, president of the Cincinnati Car Company and chief engineer of the Cincinnati Traction Company and W. Kesley Schoepf, president of the Cincinnati Traction Company. Mr. Brett joined the party at Hot Springs.

FOREIGN TRADE OPPORTUNITY.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices at New York, N. Y., Chicago, Ill., New Orleans, La., San Francisco, Cal., Atlanta, Ga., Seattle, Wash., and Boston, Mass. Apply for addresses in letter form, giving file numbers.]

NO. 13,652. GLASS BULBS.—An American consular officer in the United Kingdom reports that a firm is in the market to purchase large quantities of thin glass bulbs for use in manufacturing electric incandescent lamps. Illustrations of the shapes desires accompanied the report. Samples and prices of bulbs should be forwarded to the firm named in the report.

NEW PUBLICATIONS.

COLORADO UTILITIES COMMISSION.—The Public Utilities Commission of the State of Colorado, Denver, has issued circular No. 1 containing the text of the law creating the new commission.

MINERAL RESERVES.—Bulletin 599 of the United States Geological Survey is entitled "Our Mineral Reserves" by George O. Smith. This comprises 48 pages, and consists largely of an inventory of the mineral resources of the United States.

ELECTRIC LAMPS FOR USE ABOUT GAS WELLS.—The Bureau of Mines, Washington, D. C., has issued Technical Paper 79 entitled "Electric Lights for Use About Oil and Gas Wells," by H. H. Clark. This paper recommends the use of a 200-volt eight-candlepower carbon-filament lamp for this purpose.

GATE STRUCTURES FOR IRRIGATION CANALS.—The United States Department of Agriculture has published bulletin No. 115 entitled "Gate Structures for Irrigation Canals," by Fred C. Scobey, irrigation engineer. This paper is a contribution from the Office of the Experiment Station, A. C. True, director. The bulletin is of interest to engineers and directors of farmer canal companies in the irrigated sections of the west.

OUR MINERAL RESERVES.—George Otis Smith, director of the United States Geological Survey, Department of the Interior, Washington, D. C., has compiled bulletin No. 599 entitled "Our Mineral Reserves—How to Make America Industrially Independent." This contains an introductory chapter which is in part an answer to the inquiry as to how to obtain this or that mineral product and to stimulate requests for co-operation. Mr. Smith is convinced that America's opportunity is ripe to make its mineral industry even more dominant as a factor in the world commerce.

DATES AHEAD.

Illuminating Engineering Society. Annual convention, Cleveland, O., September 21-24. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Indiana Electric Light Association. Annual convention, Hotel Severin, Indianapolis, Ind., September 23-24. Secretary, Thomas Donohue, La Fayette, Ind.

Electrical Contractors' Association of Massachusetts. Annual convention, Worcester, Mass., September 23-24. Secretary, H. D. Temple, Worcester, Mass.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, Canada, October 1-3. Secretary, Joseph W. Richards, South Bethlehem, Pa.

New York Electrical Exposition and Motor Show of 1914. Grand Central Palace, New York, N. Y., October 7-17. General manager, George F. Parker, 124 West Forty-second Street, New York, N. Y.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 12-16. Secretary, Miss E. B. Burritt, 29 East Thirty-ninth Street, New York, N. Y.

Jovian Order, Annual congress, St. Louis, Mo., October 14-16. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Arkansas City, Kans., October 22-24. Secretary, W. H. Fellows, Leavenworth, Kans.

Telephone Pioneers of America Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York, N. Y.

With the Electrical Manufacturers

The Transmission Engineering Company, Pittsburgh, has published a bulletin illustrating and describing weatherproof oil circuit-breakers for 2,500 volts. Copies of this bulletin will be sent to those interested upon request.

The Menominee Electric Manufacturing Company, Menominee, Mich., is distributing a 156-page catalog which completely describes the varied line of electrical goods which it manufactures. Copies of this catalog will be sent to those interested upon request.

The Thompson Electric Company, 5606 Euclid Avenue, Cleveland, O., has sent out cards in which a pertinent distinction is made between a reflector and a shade. Incidentally the advantage of using Thompson safety cutout hangers to eliminate the loss from dirty reflectors is pointed out.

Pass & Seymour, Incorporated, Syracuse, N. Y., manufacturer of P & S electrical specialties, has for some time had in preparation complete Spanish and Portuguese literature describing its products, and will be pleased to furnish to those interested full information regarding the adaptability of its products for export.

The Trumbull Electric Manufacturing Company, Plainville, Conn., announces "Circle T" armored cable and flexible steel conduit. The company states that the material is high grade in every particular. Machinery and patent rights have been purchased from the former manufacturer and the Trumbull Company will make the material in its own factory under improved conditions.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has ready bulletin No. 3256, which describes a new line of direct-current and alternating-current motors specially designed for driving family washing machines. These motors are made in two sizes, one-eighth and one-sixth horsepower. The bulletin describes them in detail and gives dimension diagrams, specifications, speeds, weights, prices, etc.

Edison Lamp Works of General Electric Company, Harrison, N. J., has issued, as bulletin No. 43,404, a detailed report of a meeting of the New England Street Railway Club held last spring to discuss street-car lighting. There is reproduced an illustrated lecture by George H. Stickney, together with general discussion of the subject by several other illuminating engineers and experts. The use of Mazda lamps with reflectors was strongly advocated.

The J. H. Fowler Company, Chicago, dealer in cedar poles, which was recently incorporated, thus giving it additional advantages to handle its increasing business, carries a complete stock—and a fair supply of every length of cedar pole—in its main yard at Whiting, Ind. (a suburb of Chicago). J. H. Fowler, president of the company, started in the pole business in 1900, and claims to be the pioneer in the business of shipping Idaho, now known as Western, cedar poles to the East.

George Cutter Company, South Bend, Ind., has issued bulletin No. 3210 dealing with Cutter Sol-Lux fixtures. This is a very extensive line of fixtures designed to meet the various requirements for which gas-filled tungsten

lamps are suitable. Among the fixtures are bracket and pendent fixtures for building-front illumination, various types of fixtures for interior use, street hoods and brackets for series street lighting, series street pendants, ornamental brackets and column fixtures, ornamental posts, etc.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued catalog No. 54 which deals with the Leeds & Northrup fault-finder. This is an instrument made up for convenient determination of faults on telephone, telegraph and other circuits; it is designed particularly for use with the Murray and Varley loop methods. The catalog also describes the type S dial and the plug decade portable testing sets. The company has also issued bulletin No. 177 dealing with its thermocouple-pyrometer system. This includes a potentiometer indicator for the pyrometer and is made for measurement of all temperatures up to 2,500 degrees Fahrenheit.

Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill., have issued bulletin No. 156 dealing with electric polishing and grinding motors. These machines have each of them a self-contained motor, either direct current or alternating current. The machines are made in several sizes from one-tenth to eight horsepower and include, if desired, various attachments, such as tool rests, guards, etc. The bulletin has many illustrations and also gives a list of users of these machines.

Triumph Electric & Ice Machine Company, Cincinnati, O., will supply all electrical equipment, including generators, switchboards and motors, to be used in the large addition to the power building now being erected by the Franklin Coated Paper Company, of Frankln, O. Engines for the plant will be supplied by the Ball Engine Company. The contracts have been let by Architects Stegner, Hughes & Alves, of Cincinnati.

Record of Electrical Patents.

Issued by the United States Patent Office, September 8, 1914.

1,109,657. Switch - Controlling System. C. E. Beach and H. W. Doughty, assignors to G. O. Knapp, New York, N. Y. Interlocking latches for series-parallel switch group.

1,109,659. Art of Soldering. A. R. Braden, assignor to United Shoe Machinery Co., Paterson, N. J. The pieces are electromagnetically clamped.

1,109,678. Electromagnetic Device. E. M. Jones, assignor to Jones Signal System Co., Atlanta, Ga. A pair of magnet coils, one with differential windings for controlling a signal.

1,109,684. Signal. A. L. Maillard and L. H. Crook, Washington, D. C. Motor-driven.

1,109,686. Telephone-Exchange System. F. R. McBerty, assignor to Western Electric Co. Automatic switching and call-storing registers.

1,109,689. Electric-Circuit Closer and Breaker. T. H. McQuown, assignor to A. A. Kent, Philadelphia, Pa. For rotation counter.

1,109,703. Telephone-Exchange System. F. N. Reeves, assignor to Western Electric Co. Power-driven trunk-hunting selector switch.

1,109,707. System of Elevator Control. J. C. Smith, Louisville, Ky. Has solenoid - operated interconnected switches.

1,109,726. Pothead. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. For terminal of underground cable.

1,109,732. Automatic Spark-Timer for Internal-Combustion Engines. G. R. Wright and F. W. Johnson, Sardis, B. C., Canada. Has centrifugally moved contact arms.

1,109,733. Fuse - Holder. H. W. Young, Chicago, Ill. Details of cartridge-fuse casing.

1,109,735. Electric Attachment for Carbureters. A. S. Bignell, Bergerville, Que., Canada. Electrically heated.

1,109,755. Electric Routing-Machine. S. Hunter, Pittsburgh, Pa. Motor-driven.

1,109,764. Electrode for Vapor Electric Apparatus. C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. Anode and seal therefor.

1,109,770. Electric Switch. A. B. Lee, Oakland, Cal. Rotary indicating switch.

1,109,778. Relay Contact Device. G. C. Murphy, Louisville, Ky. Contact shoe for relay switch.

1,109,818. Telegraph Key. R. L. Boulter, Los Angeles, Cal. Details of construction.

1,109,825. Armature. C. W. Dake, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. Special support for the commutator.

1,109,827. Pneumatic-Dispatch-Tube Apparatus. M. L. Emerson, assignor to American Pneumatic Service Co., Boston, Mass. Remote electric control for the speed of the motor-driven air pump.

1,109,830. Quadruplex Telegraph System. J. Gott, assignor to Commercial Cable Co., New York, N. Y. Includes regulated means for transmitting line impulses of opposite polarity.

1,109,833. Fire-Fighting System. H. T. Hall, Oakland, Cal. Includes electrically controlled water-pumping units.

1,109,841. Apparatus for Use in Tabulating Systems. H. Hollerith, Washington, D. C. Electromagnetically controlled recording mechanism.

1,109,850. Electric Slow-Down Device. D. L. Lindquist, assignor to Otis Elevator Co., Jersey City, N. J. Electromagnetic brake for elevators.

1,109,859. Fire-Alarm. M. Moloney, Christchurch, New Zealand. Circuit-closer.

1,109,878. Alarm Cable. J. Sulzbacher, New York, N. Y. Comprises a number of signal wires and a circuit wire held together by coverings to form the main body of the cable, and a number of independent thermostatic sections at intervals on the outside of the cable and adapted to close the signal circuit.

1,109,879. Railway Signaling System. L. H. Thullen, assignor to Union Switch & Signal Co., Swissvale, Pa. Alternating-current block-signal system.

1,109,880 and 1,109,881. Signaling System for Railways. L. H. Thullen, assignor to Union Switch & Signal Co. Alternating-current block-signal systems for direct-current railways.

1,109,887, and 1,109,888. Manufacture of Electric Filaments. C. Auer von Welsbach, Vienna, Austria-Hungary. First patent provides for a filament containing osmium and partly reduced oxide compounds of thorium; the second patent covers a filament of osmium with which is alloyed zirconium.

1,109,899. Brush for Electric Contacts. J. E. Colas and E. L. M. Ragonot, Paris, France. Flexible and lubricated holder for laminated brush.

1,109,901. Reversible Brush-Holder for Dynamos. J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. Brush is electromagnetically reversed when machine rotation reverses.

1,109,909. Wireless Oscillator. H. P. Dwyer, assignor to Dwyer Wireless Telephone & Telegraph Co., San Francisco, Cal. Has electrodes immersed in alcohol, one electrode having an aperature opposite the center of the other, and means for producing a continuous flow of alcohol through the aperature.

1,109,919. Switch-Key. A. F. F. Gilson, assignor to Western Electric Co. For telephone switchboard.

1,109,940. Electrical Apparatus. H. E. Reeve, New York, N. Y. Includes a flexible phosphor-bronze diaphragm.

1,109,947. Switch-Key G. P. Tromp, assignor to Western Electric Co. For telephone switchboard.

1,109,950. Signaling Apparatus. A. Andren, assignor to Elevator Supply & Repair Co., Chicago, Ill. Electric signaling system for elevators.

1,109,958. Mail-Opening Machine. C. J. Bryant, Chicago, Ill., assignor of one-half to J. P. Wallis. Motor-driven.

1,109,960. Automatic Telephone-Testing System. W. L. Campbell, assignor to First Trust & Savings Bank, Chicago, Ill. Includes special form of connector switch.

1,109,969. Electric Bell. W. J. Cook and M. W. Breuer, assignors to Cook Railway Signal Co., Denver, Colo. Alternating-current bell.

1,109,992. Controller for Automatic Musical Instruments. A. Jameson, assignor to F. R. Henshaw, Indianapolis, Ind. Pistons operating air cylinders are electrically controlled.

1,110,012. Timbre Controller for Electrical Musical Instruments. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Mfg. Co. Magnetically-attractive tuned sonorous bodies are vibrated by imparting synchronous current pulsations to electromagnets attracting the same.

1,110,021. Electrically Controlled Switch. H. E. White, assignor to General Electric Co. A contactor with moveable core and double winding.

1,110,027. Telephone Switching System. W. Aitken, Liverpool, Eng. An automatic system.

1,110,028. High-Frequency Alternator. E. F. W. Alexanderson, assignor to General Electric Co. Rotor and stator of disk form, the former being a slotted disk and the latter having windings.

1,110,029. High-Frequency Alternator. E. F. W. Alexanderson, assignor to General Electric Co. Rotor for generator covered by 1,110,028.

1,110,030. Bearing. E. F. W. Alexanderson, assignor to General Electric Co. A bearing for high-speed machines designed to compensate for expansion of shaft.

1,110,039. Series - Parallel Control System. E. R. Carichoff, assignor to General Electric Co. Employs contactors.

1,110,066. Shade and Socket-Holder. W. F. Little, assignor to The Baltimore Enamel & Novelty Co., Baltimore, Md. Shade and socket-holder threaded to fit conduit. (See cut.)

1,110,071. Automatic Trunking System. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Has a set of trunks for each group of subscribers and common trunks with automatic means for using latter when all trunks in one group are in use.

1,110,076. Incandescent Electric Lamp. D. J. O'Brien, San Francisco, Cal., assignor to Straight Filament Lamp Co. A tubular lamp with means for operating any number of filaments in parallel.

1,110,086. Power System for Autovehicles. R. Varley and W. W. Macfarren, assignors to Varley Duplex Magnet Co., Jersey City, N. J. An automatic dynamo-battery arrangement for starting and lighting automobiles.

1,110,094. System of Control for Electric Motors. E. S. Zuck, assignor to Westinghouse Electric & Mfg. Co. Includes a ratchet-and-pawl mechanism and solenoids for advancing contact-making member.

1,110,098. Insulated Rail-Joint. J. H. Allen, Verona, N. J. Insulating plates surround bolts and are placed between rails and filler angles.

1,110,099. Lamp-Socket. V. G. Apple, assignor to the Apple Electric Co., Dayton, O. Has a cylindrical contact and a spring-pressed center contact.

1,110,100. Toy Figure. C. Ambash and N. Morgenstern, Brooklyn, N. Y. A "Teddy bear" the eyes of which are electrically lighted and which is also provided with electric sound-producing device. (See cut.)

1,110,134. Motor-Vehicle Construction. E. Gruenfeldt, assignor to The Baker Motor Vehicle Co., Cleveland, O. Motor hung longitudinally from frame by universal joint.

1,110,151. Protective Device. H. A. Steen, assignor to Allis-Chalmers Mfg. Co. An electrically operated time-element device.

1,110,152. Electromagnetically Operated Thermosat. H. A. Steen, assignor to Allis-Chalmers Mfg. Co. An alternating-current magnet is moveable into and out of effective position with thermostat.

1,110,153. Thermostat. H. A. Steen, assignor to Allis-Chalmers Mfg. Co. A modification of 1,110,151.

1,110,163. Electric-Lamp Receptacle for Signs. G. B. Thomas, assignor to The Bryant Electric Co., Bridgeport, Conn. Includes means for fastening receptacle to sign plate.

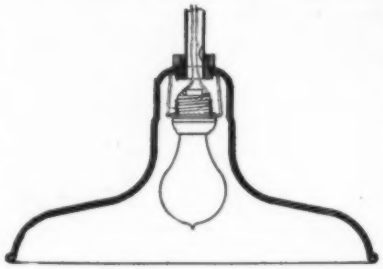
1,110,166. Machine for Producing Electrical Coils. C. R. Underhill and D. J. Kelsey, assignors to The Acme Wire Co., New Haven, Conn. For winding solenoids.

1,110,179. Lightning Arrester. E. Bennett, Olmstead, Utah. Has a spark gap and resistances.

1,110,193. Attachment Plug. E. E. Dougherty, San Bernardino, Cal. Formed of two jawed members. (See cut.)

1,110,199. Motor-Vehicle Construction. E. Gruenfeldt, assignor to The Baker Motor Vehicle Co., Cleveland, O. Motor, drive connections, arms and rear-axle housing move as a unit.

1,110,208. Process of Electrically Treating, Melting, and Refining Metals.



1,110,066.—Shade and Socket Holder.

C. A. Keller, Paris, France. Melted metals refined in electric furnace.

1,110,228. Telephone Receiver. A. Plecher, Las Animas, Colo. Diaphragm has central and marginal vibratory portions, the magnet being opposite the former.

1,110,253. Means for Producing Oscillating Currents of High Frequency. A. H. Cohen, San Francisco, Cal. Utilizes spark gap and spray of liquid.

1,110,100.—Electric Toy.

1,110,254. Maximum-Demand Electric Meter. L. H. Conklin, East Orange, N. J. Expansion of conductors imparted to index finger.

1,110,259. Electric Line-Apparatus Protector. P. K. Higgins, assignor to F. R. Parker, Chicago, Ill. Fuse consists of fusible substance in carbon container.

1,110,193.—Attachment Plug.

1,110,271. Swivel Attachment Plug. C. D. Platt, Bridgeport, Conn. A two-piece attachment plug permitting ready access to terminals.

1,110,285. Electrically Operated Hammer. F. E. Brixius, Manitowoc, Wis., assignor of one-half to G. P. Brunner. Employs motor and solenoids.

1,110,291. Insulated Rail-Joint. J. R. Keller, assignor to the Rail Joint Co., New York, N. Y. Insulation placed between interlocking members.

1,110,303. Method of Manufacturing Alloys of Tungsten and other Highly-Refractory Metals Related to It. H. Kreusler, assignor to General Electric Co. A ductile metallic alloy of 90 per cent tungsten and a least five per cent nickel.

Reissue 13,798. Original No. 877,451, Jan. 21, 1908. Means for Receiving Intelligence Communicated by Electrical Waves. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. A crystal detector.

Patents Expired.

The following United States electrical patents expired September 14, 1914:

589,830. Secondary Battery. H. W. Headland, London, England.

589,832. Electrical Signaling Device for Use on Pneumatic Conveyer-Tubes. G. W. Hook, London, England.

589,838. Coil for Electrical Machines and Method of Making Same. B. G. Lamme, Pittsburgh, Pa.

589,839. Armature for Electrical Generators and Motors. B. G. Lamme.

589,842. Method of Manufacturing Electrodes for Secondary Batteries. H. Leitner, Niederschonhausen, Germany.

589,845. Coil for Electrical Machines. J. P. Mallett, Pittsburgh, Pa.

589,865. Switch for Electric Circuits. H. B. Shallenberger, Rochester, Pa.

589,881. Apparatus for Suspending, Raising, and Lowering Electric Lamps. M. R. Warner, Manchester, and C. O. Bulock and A. E. McLaughlin, York Haven, Pa.

589,891. Elevator Controller. M. W. Day, Schenectady, N. Y.

589,893. Automatic Switch for Surface-Contact Railways. E. M. Hewlett, Schenectady, N. Y.

589,894. Surface-Contact Railway. E. M. Hewlett.

589,904. Dynamo Brush-Holder. J. A. Marsh, St. Louis, Mo.

589,938. Electrical Cigar-Lighter. T. C. Dobbins, Telluride, Colo.

589,996. Electric Arc Lamp. T. E. Adams, Cleveland, O.

590,000. Mounting for Commutators of Dynamo-Electric Machines. E. Caemmerer, Chicago, Ill.

590,050. Electromedical Exercising Apparatus. W. A. Webb, Brooklyn, N. Y.

590,082. Trolley and Conductor for Electric Railways. T. Von Zweigergk. Cleveland, O.

590,098. Alternating-Current Generator. H. Fairbanks, St. Johnsbury, Vt.

590,120. Conductor. J. Swinburne, London, England.

590,121. Electric Trap. G. B. Vaughan, Kirkwood, Mo.

590,136. Telephone-Exchange System. W. W. Dean, St. Louis, Mo.

590,137. Telephone System. W. W. Dean.

590,151. Secondary Battery. G. Hart, Detroit, Mich.

590,171. Electric Bath. J. J. Stanger, Stuttgart, Germany.

590,185. Telephone-Exchange System. W. W. Dean.

590,186. Telephone System. W. W. Dean.